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**20 December 1979**

# **USSR Report**

**CHEMISTRY**

**No. 66**



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20 December 1979

## USSR REPORT

## CHEMISTRY

No. 66

This serial publication contains articles, abstracts of articles and news items from USSR scientific and technical journals on the specific subjects reflected in the table of contents.

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USSR

IDC 541.183

## MICROPOROUS STRUCTURES OF CARBON ADSORBENTS. REPORT 1: GENERAL CHARACTERISTICS OF THE MICRO- AND SUPERMICROPORES FOR THE SLIT-LIKE MODEL

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 pp 1691-1696 manuscript received 10 Apr 78

DUBININ, M. M., Moscow, Institute of Physical Chemistry, USSR Academy of Sciences

[Abstract] On the basis of the mechanisms of adsorptive and capillary effects occurring in pores of adsorbents, and especially of carbon adsorbents, the two smallest classes of pores, the micropores and the supermicropores are classified as measuring ( $x < 0.6-0.7$  nm) and ( $0.6-0.7 < x < 1.5-1.6$  nm), respectively, where  $x$  is the characteristic or effective pore size in the direction normal to the movement of molecules during the filling of pores. The model of the porous structure of carbon adsorbents and of its formation is formulated: In the process of the activation of carbonized organic materials (at  $850-950^{\circ}\text{C}$ ) the first to burn out is the least dense amorphous part of carbon (high-carbon radicals) as well as the crystallites, which results in the formation of the micro- and supermicropores, which act as adsorbing pores in the processes of the adsorption of gases and vapors. The principal experimental parameters of the model are discussed: the size of carbon crystallites and the pore radii of inertia, as well as the characteristic adsorption energies of a standard vapor (benzene). A relationship between the characteristic sizes of micro- and supermicropores and the characteristic adsorption energy is established. Parameters of micro- and supermicropores regarded as flat slits formed in carbon crystallites are computed on the basis of the adopted model. References 15: 7 Russian, 8 Western. [10-1386]

USSR

UDC 543.4:543.27

#### RAPID PHOTOMETRIC ANALYSIS OF HYDROGEN FLUORIDE IN AIR

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 34, No 7, Jul 79  
pp 1306-1308 manuscript received 2 Feb 78

II.'INSKAYA, G. I. and MUDROLYUBOVA, N. S., All-Union Scientific Research and Design Institute of Aluminum, Magnesium and Electrode Industry, Leningrad

[Abstract] This analysis is based on the specific reaction of the fluoride in forming a lanthanum-alizarin complex. Reagents include  $1.67 \times 10^{-2}M$  solutions of alizarin adjusted to a pH = 4.5 with  $CH_3COOH$ , and lanthanum nitrate, standard  $F^-$  solutions containing from 1 to 10 mg/l HF prepared from NaF, and a  $NaNO_3/CH_3COOH$  buffer solution. Determinations were made at a  $\lambda_{max} = 610nm$  where the molar coefficient of absorption is  $1.09 \times 10^4$ . Interferences were noted for the following ions at the given ion: fluoride ratios: 2.5 -  $BO_3$ ; 5 - Mg, Ca,  $PO_4$ ; 10 -  $Cl_2$ ; 40 -  $SiO_2$ ; 1000 -  $SO_3$ ,  $SO_4$ ; and 1500,  $CO_3$ . Al and Fe strongly reduce the absorption. The sensitivity is  $2 \mu g/m^3$  HF with an air pumping rate of 2l/min through a filter. References 7: 4 Russian, 3 Western.

USSR

UDC 614.3

#### DETERMINATIONS OF RESIDUAL AMOUNTS OF PESTICIDES IN FOOD PRODUCTS AND IN THE ENVIRONMENT

Moscow ZHURNAL ANALITICHESKOY KHIMII in Russian Vol 34, No 7, Jul 79  
pp 1382-1401 manuscript received 16 May 77

KLISENKO, M. A., All-Union Scientific Research Institute of Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev

[Abstract] This article summarizes the literature (especially since 1973) on several important aspects of the title process. Topics addressed are methods for separating pesticides from the samples, methods for purifying the extract (including ion-exchange chromatography, high-pressure liquid chromatography, partitioning between two insoluble liquids, distillation, and steam distillation), methods for their quantitative determination (including paper chromatography, thin-layer



chromatography, gas chromatography together with associated hardware, liquid chromatography, plasma chromatography, ultra-violet and fluorescence spectroscopy, atomic absorption for organomercury compounds, kinetics, activation analysis and polarographic techniques), and a final section on methods of identifying the pesticides and their metabolites (including nuclear magnetic resonance, electron spin resonance, chemical ion mass spectrometry, UV and IR and Raman spectroscopy as well as standard gas chromatograph techniques). References 284: 104 Russian, 180 Western.

## INDICATOR AUREOLES ASSIST IN GEOLOGICAL PROSPECTING

Moscow IZVESTIYA in Russian 14 Sep 79 p 2

[Article by I. Novodvorskiy "Geologist's Chemical Compass"]

[Text] On 13 September 1979, the State Committee on Matters of Inventions and Discoveries registered a discovery made by Soviet geologists Professor S. Grigoryan and USSR Academy of Sciences Corresponding Member L. Ovchinnikov.

Deposits of many valuable minerals such as gold, silver, zinc, lead, copper and tantalum are very small and therefore often hidden deep under layers of non-ore rocks. Miners long ago called attention to the fact that there frequently are, around ore deposits, mineral changes which facilitate the search for them. Later geologists succeeded in revealing aureoles of chemical elements which are invisible to the eye. In these aureoles were found not only chemical elements, which form ore minerals but also which accompany them in the ores. Such chemical elements are called indicators.

However, aureoles may be situated above, below or on the mineralization level. Great amounts were expended on opening obviously unpromising aureoles where deposits of their residues were or were not found.

The discovery registered here changed this situation significantly. The authors established special indicator-elements of the supra-ore, ore and sub ore parts of deposits. This made possible determination of the prospectiveness of geochemical anomalies without drilling and cutting.

It was possible to show that, for uniform deposits, specific elements-indicators ratios indicate the distance to the ore deposits, that is, it is possible to predict the depth at which to search for ore.

Presently, on the basis of methodical recommendations of the authors, the discovery is being used extensively not only in the USSR but also in some foreign countries. This discovery has already provided the base for several inventions which improve the effectiveness of geological operations significantly.

USSR

UDC 577.155.3:547.458

THE IMMOBILIZATION OF E. COLI L-ASPARAGINASE ENZYME ON POLYSACCHARIDES.  
II. COVALENT BONDING WITH SOLUBLE KM-CELLULOSE

Tashkent KHIMIYA PRORODNYKH SOYEDINENIY in Russian No 3, 1979 pp 383-388  
manuscript received 23 Jan 79

KINSTLERM, O. B., KARSAKEVICH, A. S., SHYLICHENKO, S. N. and ZHAGAT, R. A.,  
Institute of Organic Synthesis, Academy of Sciences, Latvian SSR, Riga

[Abstract] E. coli L- asparaginase was combined with soluble KM-cellulose by the azide method and the complex partially on Sephadex G-25, giving a wide peak with a shoulder which was divided into two fractions. The absence of noncovalently bound L-asparaginase was demonstrated by Sephadex G-200 gel chromatography. UV spectra of the two fractions were identical with that of native enzyme and disc electrophoresis on polyacrylamide showed the complex to have the same mobility as the most diffused enzyme band. The pH optimum of the first fraction was sharper than native enzyme and somewhat shifted to alkaline pH. Fraction one demonstrated increased thermal stability and both had increased resistance to the proteolytic enzymes papaverin, trypsin and pronase. The stability increase was higher at 5 minutes than 2 minutes, which is an important factor for designing new pharmaceutical forms of the enzyme. Figures 7; references 10: 6 Russian, 4 Western.

USSR

UDC 547.898:541.128.35

CROWN ETHER IMMOBILIZED ON SYLOCHROME AS A NEW HETEROGENEOUS CATALYST

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 247, No 5, 1979  
pp 1153-1158 manuscript received 2 Feb 79

BOGATSKIY, A. V., Academician of the Ukrainian Academy of Sciences,  
LUK'YANENKO, N. G., and PASTUSHOK, V. N., The Institute of Physics and  
Chemistry of the Academy of Sciences of the Ukrainian SSR, Odessa

[Abstract] Dibenz-18-crown-6 was immobilized on sylochrome S-120 using cis-diaminodibenz-18-crown-6 in reaction with the sylochrome, which had previously been treated with sulfinyl chloride. Results showed that the reaction rate was increased by the immobilized catalyst, although not as much as by a free crown ether catalyst. The process can be applied to chemical reactions such as nucleophilic substitutions. Tables 1; references 6 Western. [05-12131]

12131

CSO: 1841



ANALOGUES OF D(+)-PANTOTHENIC ACID. V. THE SYNTHESIS AND STRUCTURAL INVESTIGATION OF N-PANTOYLPROLINE DERIVATIVES

Tashkent KHIMIYA PRIRODNYKH SOYEDINENIY in Russian No 3, 1979 pp 378-383

MARIYEVA, T. D., KOPELEVICH, V. M., MISHCHENKO, V. V., STAROSTINA, A. K., YUZEPOVICH, L. YU., TOROSYAN, ZH. K. and GUNAR, V. I., All-Union Scientific Research Vitamin Institute, Moscow

[Abstract] Since modification in the amino acid portion of pantothenic acid increases membrane permeability to the drug and since proline was recently shown to be a neuromediator, pantothenic acid proline derivatives were synthesized and studied. N-D-pantoyl-Z-proline was obtained by reacting D-pantolactone with the sodium salt of Z-proline in boiling methanol and was purified with cation exchange resins, giving a yield of about 50%. IR, NMR and Mass Spectroscopy indicate that an anhydride of the product due to intramolecular rearrangement was obtained at a 10% yield. N-D-pantoly-L-oxypoline and its anhydride were synthesized analogously. Fusion of D-pantolactone with DL-proline without solvent at 140° led to only anhydride formation. IR data indicated the presence of unionized carboxylic or amide groups, the noncoplanarity of the amide and the presence of hydroxyl groups. The IR spectrum of the model compound gamma-oxybutyryl-L-proline was obtained by condensing gamma-butyrolactone with the sodium salt of L-proline and Draiding models indicated the possibility of intramolecular hydrogen bonding in the pnatoyl-proline derivatives forming nonplanar 8-membered rings and planar 6-membered rings. In the cyclic molecule both free and bound hydrogen bounds are seen in the IR and PMR spectra. The uncyclized form has mainly cis axial hydrogens. References 12: 2 Russian, 10 Western.

**WORLD'S LARGEST HIGH PRESSURE POLYETHYLENE PLANT GOES ON STREAM**

**Moscow SOTISALISTICHESKAYA INDUSTRIYA in Russian 28 Sep 79 p 3**

[Article by A. Polekhin (special correspondent), Halle-Moscow, "Polimir-60 the Offspring of Friendship"]

[Text] The people at the "Loyna" [Leine?] were waiting for this moment with particular impatience. The start of Polimir-60 was the main topic of conversation at the combine: the world's largest automated installation for the production of polyethylene by the high-pressure method was going on stream. This installation, conceived by scientists and designers of the USSR and GDR, by the intensive labor of workers and engineers of these two countries, is the product of socialistic economic integration.

Ten years ago, a government agreement was signed by the USSR and GDR concerning collaboration in the area of production of polyethylene by the high-pressure method. At that time, there were only the theoretical substantiations for drastic acceleration of chemical reactions in the process of unstable equilibrium. Specialists of the Soviet Union and German Democratic Republic were going to transform theory into a strict technological process for the first time in the world.

For several years, specialists of both countries, united in joint working groups, conducted research in common laboratories.

Prof Manfred Retzsch, who headed the German research team, said: "What has always impressed me in this joint work on the project is the broad exchange of opinions, in which everyone voiced his view on some issue openly and with conviction."

At the early stages there were some skeptics even among the pioneer developers. But the common enthusiasm and desire to solve the unsolvable yielded their fruit. In late 1974 (only 5 years after signing the agreement), the Polimir-60 installation at the local combine in Novopolotsk

turned out the first product. But this was not the end of the joint work. In store was an even larger project, Polimir-60, at the Loyna chemical combine. This is where enterprises of the USSR and GDR delivered equipment for production of the scarce product, in accordance with the new agreement.

As compared to the enormous scale of Loyna-1, this project appears to be quite modest. But herein lie the achievements of the scientists and designers, who were able to plan the project in such a manner, to construct the entire process, which incidentally is controlled by only four people at a central console, that the installation, which occupies many times less area than its older "sister," produces as much polyethylene as all four preceding ones together.

Yuriy Shmonii, leader of the group of Soviet engineers at the combine, tells us: "Such an achievement did not just happen. And although today we can refer to Polimir-60 in the past tense, it will be difficult for us to forget the friendly atmosphere, warmth and cordiality of our hosts, their promptness and business-like attitude. Let us consider, for example, the international brigades formed at the construction site, not even brigades, but entire groups of German and Soviet specialists. Such a group would solve a specific problem, for example, installation of a unit or part. It would have the same obligations of socialist competition, the same plan and two languages, Russian and German."

Starting up Polimir-60 was a question of honor for the entire staff of the enterprise. But a particular responsibility was borne by its immediate creators, the communists of the administration for major construction of Loyna. It was clear to each of them that Polimir-60 was not only a substantial contribution to development of the republic's national economy, it was also the practical implementation of a close alliance between two fraternal nations.

Horst Philip, secretary of the combine's party committee for economics, tells us: "After the 9th Congress of the Socialist Unity Party of Germany, a movement was deployed at the combine entitled "Guarantee." Its participants guaranteed the quality and quantity of production. But when our specialists returned from Novopolotsk, after learning about their future job, the movement acquired another, new direction, to broaden the service area. This visit to a similar combine was beneficial to the enterprise in two ways: the specialists underwent solid training and Loyna gained a significant economic effect from adopting the knowhow of Novopolotsk."

Yes, the knowhow of Belorussian chemists is being used extensively at the combine. Nor was it overlooked at Polimir-60. An in-depth analysis of the operation of the related installation, thorough refinement of the operating process and comprehensive documentation made it possible to shorten the check-out of equipment at Loyna by almost 2 weeks. But even

this solid gain in the race with time did not weaken creative enthusiasm at the most important project. Soviet and German specialists checked again and again the technological chains, tested the reactor, compressors, refrigerators and granulator. At first, these were checks for inert gases, then the conditions became more complicated. Finally, there remained, as they say, the "hot check," starting up the operation. Everyone was anxious for this moment, for the international brigade had a slogan, "We shall leave Loyna only when Polimir-60 will start up at its planned capacity!"

The installation began to "breathe," and this happened last Monday. Equipment manufactured in Sverdlovsk and Grimma, Sumy and Magdeburg and dozens of other cities is operating in harmony. For the combine, this long-expected moment means a stable increase in production by 180 million marks, and for the republic on the eve of its important jubilee, its 30th anniversary, it means complete supply of all requirements for scarce material of high quality. For the entire socialist concord, starting up Polimir-60 is another vivid example of the unlimited capabilities of economic socialist integration.

Those at the Loyna are highly appreciative of the assistance and support, past and present, of the first socialist nation offered to the GDR. For this reason, the report that L. I. Brezhnev, general secretary of the CC CPSU and chairman of the Presidium of the USSR Supreme Council, will head the Soviet Party and State delegation in a visit to GDR on the occasion of its 30th anniversary, elicited a new wave of enthusiasm at the combine, as well as everywhere in that country.

10,657  
CSO: 1841



## RECONSTRUCTION OF RUSTAV AMMONIA PLANT DELAYED

Tbilissi ZARYA VOSTOKA in Russian 30 Sep 79 p 1

[Article by NOVAYA ZARYA post staff at the site of modernization of the Rustav Chemical Plant: M. Agvemashvili, instrument controller in synthesis shop No 1; T. Murdzhikneli, brigade leader of Zakavkazmetallurgstroy SU-1 trust No 1; Yu. Sokol'skiy, on the staff of the plant newspaper, KHIMIK; and N. Kvizhinadze, correspondent of ZARYA VOSTOKA, "It Is Up to the Installation Workers"]

[Text] The construction workers and fitters [installation workers] involved in modernizing the Rustav Chemical Plant are on the finish line. Each day and each hour are strictly accounted for. There is still much work to be done. The target dates have to be met, and three projects planned for completion in the fourth year of the Five-Year Plan must be delivered on time: the ammonia, ammonium nitrate and nitric acid shops.

The brigade of the Gruzmekhanomontazh trust fitters, headed by Boris Pshenichnyy is working at a rapid pace. This pace-setting team is working on installation of equipment for production of ammonia. The shift norms are being 20-30% overfulfilled; the productivity of labor and quality of work performed are consistently high.

The workers of the Tiraspol' Installation Administration, which is actively involved in modernizing the chemical giant of Transcaucasia, are not lagging behind the pace-setters. They are demonstrating examples of selfless labor, and they are working very productively on installation of the water treatment unit and pump house. The ability to accurately estimate and plan shifts, to direct the main effort of the brigade toward solving the most important problems is the basis for the efficient work of the Tiraspol' workers.

Much now depends on the smooth work of the installation workers. However, the rapid work pace does not apply to all areas. This is all the more inadmissible if we consider that very tight target dates have been set

for installation of equipment. Today, only 37% of the equipment has been installed in the ammonia shop, while construction and installation work is 82% completed; the figures are 31% and 72% completed, respectively, for the ammonium nitrate shop, 66% and 72% for the nitric acid shop.

These figures cannot satisfy either the customer, i.e., management of the Rustav Chemical Plant, or the general contractor, trust No 1 of Zakavkaz Zakavkazmetallurgstroy, Georgian Ministry of Construction. The staff for modernization of the chemical plant must accurately plan the final stage of work on projects within the specified time expressly now, at the turning point in construction of the enterprise, when slightly over a month is left before the nitric acid and ammonium nitrate shops must go on stream. The workers in the dispatch and supply services must display a high degree of flexibility. Quite often, the work pace is slowed down by delayed delivery of some technological equipment, parts, machines and mechanisms to the installation site.

A special role in expediting reconstruction is assigned to Party organizations of enterprises and organizations involved in construction. The communists must make strict demands of laggards and see that a maximum effect is obtained in each minute of work in those sectors of construction where there have been breakdowns. Unfortunately, there are still instances of infraction of work and technological discipline on the construction project. Not only do they have an adverse effect on progress of the work, but they could delay the starting time for elements of the complexes to be delivered.

The second anniversary of the USSR Constitution is approaching. Many construction and installation organizations involved in modernizing the Rustav Chemical Plant are making preparations for a worthy celebration of this holiday. On the eve of this event, each sector and each construction project brigade must organize their work in such a manner that each item on the tight starting schedule will be performed at the specified time. This is feasible. All we have to do is to reinforce the enthusiasm that prevails today at the main installation sites. This is the main task for each administrator of this large project and for each Party organization.

10,657  
CSO: 1841

## AMMONIUM NITRATE AND NITRIC ACID PLANT

Moscow STROITEL'NAYA GAZETA in Russian 10 Oct 79 p 3

[Article by V. Filin, nonstaff correspondent, Voronezh, "It Is Now Up to the Chemists"]

[Text] There is a celebration at the Pridonskiy Chemical Plant: the State Commission has signed a document pertaining to acceptance for operation of the first phase of the enterprise that will produce 765,000 tons of ammonium nitrate and 380,000 tons of weak nitric acid.

Within a relatively short time, slightly over 3 years, the personnel of the Pridonkhimstroy general contracting trust and department of the Voronezh Regional Administration for Construction, USSR Ministry of Construction, along with organizations of the USSR Minmontazhspeystroy [Ministry of Installation and Special Construction Work], to assist them, have completed jobs here worth 113 million rubles. Almost half of the work is construction installation.

G. Sukhmolinov, head of the territorial construction administration, tells us: "The main difficulty, I would say, was not the scope of the job. The site is more than 200 km from Voronezh, i.e., the main construction bases. It was not easy to transport thousands of workers and specialists to the rayon town of Rossosh', and to furnish them with all the necessities."

Many people who had been through the experience of working on the BAM [Baykal-Amur Railroad], the blast furnaces in Lipetsk, the Kama Motor Vehicle Plant and projects referable to the Kursk magnetic anomaly had worked at the construction project. Newcomers learned the secrets of skilled veterans at several schools of communist labor. A competition had been widely initiated among construction and installation workers according to the principle of the "Worker's [relay] baton." Many projects were erected by the method of brigade contract. It yielded particularly perceptible results for the team of carpenters and concrete workers headed by S. Gurevich.

Nor did the installation workers stay behind. Thus, the Komsomol youth brigade of A. Lykov from the second administration of the Yugovostok-tekhmontazh [South-eastern technical installation] trust, which used the progressive method of large assembly, shortened by 1.5 months the work done on the main units of the plant: weak nitric acid and ammonium nitrate shops. The brigade of S. Vereshchagin, holder of the Order of the Red Banner of Labor and Honored Builder of the RSFSR, from Yugovostok-elektromontazh [Southeastern Electric Installations], also displayed a creative attitude toward the job.

The rationalizers and inventors of the Yugovostoktekhmontazh made a particularly perceptible contribution. Under the guidance of chief engineer I. Shpital'nik, the spherical reservoirs of the liquid ammonia receiving warehouse were assembled, for the first time in Soviet practice, without the use of the traditional manipulators, but with a water cushion. This innovation reduced by one-half the time required to do the work, and made it possible to accomplish this with fewer installation workers.

10,657  
CSO: 1841

## LIQUID NITROGEN-PHOSPHORUS FERTILIZER COMPLEX AT KRASNODARSK

Moscow TRUD in Russian 11 Oct 79 p 1

[Article by G. Klyuchero, Krasnodar, "On Stream Before the Target Date"]

[Text] A complex producing liquid nitrogen-phosphorus fertilizers has gone on stream before the target date at the Krasnodar Chemical Plant. Its capacity will constitute 660,000 tons per year.

More than 20 institutes were involved in designing this complex. It was erected by 33 construction and installation organizations. A total of 3400 people labored there before it was started up. The target dates were extremely tight, less than 2 years being given to complete the entire complex. According to plans, it should have been ready for operation at the end of this year. But the participants of the All-Union key construction project decided to complete it 3 months earlier. And they kept their word.

The sulfuric acid shop is already functional. Quite recently, in September, there were celebrations here on the occasion of delivery of the first million tons of this product. Now liquid fertilizers are being produced.

I am standing near the enormous, silvery, dome-shaped structures. These are, so to speak, the fertilizer warehouses. Each of them is 7 stories high and 50 meters in diameter, and has a capacity of 20,000 cubic meters of liquid.

These structures caused quite a few problems to construction workers at the finishing stage. The schedule was tight, and it was necessary to polish the inside surface to virtually a mirror-like luster. Then all of it had to get three coats of antirust agent. This complicated work (the area of both structures is more than 10,000 square meters) was done by only three workers of the Montazhkhimzashchita [Chemical Protection of Installations] Krasnodar Administration: A. Gette, V. Kalegov and V. Agramov. The installation workers of Sevkavtekhmontazh [Northern Caucasus Technical Installations], Kavelektromontazh [Caucasus Electrical Installations] and other organizations also worked in an outstanding manner.



Yu. Maslov, head of the Krasnodarkhimstroy [Krasnodar Chemical Construction] Trust, tells us: "Six years ago, we began to erect the plant in the steppe. And in the last 2 years alone, we have put 36 projects on stream."

The following figures speak for the dimensions of this project: almost 700,000 cubic meters of reinforced concrete have been laid, about 130,000 tons of metal elements have been installed and almost 17,000 units of equipment. The enterprise that is being erected here will be almost entirely automated. Quite a lot has also been done to prevent pollution of the environment.

10,657

CSO: 1841/34

## NEW OIL REFINERY NEARS COMPLETION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Sep 79 p 2

[Article by TASS correspondent A. Pipiras "Flames of Large Construction"]

[Text] Fuel and lubricants will be supplied to the entire northwest of the country by the Mazheykyay Petroleum Processing Plant which will begin production in less than 4 months. The major stage of the work is completed at the important start-up construction; a man-made reservoir on the Varduv River which will provide power to the enterprise and the city of chemists has reached the designed level.

The majestic panorama is the first-born of Lithuanian petrochemistry. The silver columns of rectifiers where petroleum will be converted into high octane gasoline, clear silhouettes of frames of other industrial lines, powerful thermo-electric centers. The rumble of the construction continues around the clock. This is a busy time for the fitters. Maintaining the initiative of the brigades I. Ionaytisa and G. Gudzenko assumed the obligation to exceed the shift quota daily by 10 percent.

Enterprises of 150 cities of the country are participating in installation of the plant. The petroleum city is being created with the help of Polish specialists whose participation made possible laying ahead of schedule of a 500 kilometers branch from the pipeline "Druzhba" and powerful pumping stations are being installed. Underground tanks are ready to receive petroleum from the Volga Region.

2791

CSO: 1841

## SOVIET JOURNAL ACTS AS CLEARING HOUSE FOR WASTE PRODUCT UTILIZATION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 27 Sep 79 p 2

[Article by Academician I. Petryanov, chief editor of KHIMIYA I ZHIN' "'Waste Bank' Offers Dividends"]

[Text] For several years, the popular science journal of the USSR Academy of Sciences "Chemistry and Life" has presented on its pages an extremely important, from our point of view, headline -- "The Waste Bank." The idea of it was born in those days when the first guest brigade of the editorial staff worked in Nizhne-Kamsk. In a conversation with the journalists, one of the directors of the Nizhne-Kam Petrochemical Combine related an interesting and rather typical case for the industry.

An engineer from another town took command of the combine and he sought a chemical required by his plant. This product, it turned out, was listed among the production wastes of the Nizhne-Kam Chemical Combine and was discarded in considerable quantities daily. Meanwhile, the petrochemists could scarcely be reprimanded for the wastefulness since they did not even suspect the need of their own colleagues.

This is a case in which an unnecessary, discarded substance completely unexpectedly found an interested user forced us to think. Workers of the combine told us that it is very important to organize, on sectoral scales, operative information concerning such chemical products and materials. At one enterprise they are not needed, occupy space to no purpose and may even be a source of environmental pollution but, at another enterprise, they are an acute necessity as basic raw material for auxiliary materials which frequently are obtained only with considerable difficulty. Then, discussing our opportunities with workers of the Nizhne-Kam we decided, since such information is not available, to publish it in "Chemistry and Life," not only for petrochemistry enterprises but also for other sectors of the national economy.

Since then, from month to month, on the pages of the journal appear brief announcements from plants, combines and scientific research institutes: "we want to buy," "want to sell", "have available", "needed". Since the editorial staff wanted to know the effectiveness of the information placed in the journal, we contacted enterprises which made the announcements and requested their reactions. Was it possible to buy or sell anything after publication in the journal?

They explained the "Waste Bank" helped them to find users for many substances and materials. For example, according to reports of the "Suyuzuglerod" Union, in 1976-77, plants of the sector bought more than 700 tons of graphite wastes in the form of breakage and cinders of electrodes and fragments of brick lining units. One of the institutes received orders for wastes of production from more than 30 enterprises. Hundreds of tons of different wastes were salvaged as a result of our "Bank."

The "Waste Bank" still appears in "Chemistry and Life." However, the opportunities of the journal are limited. Meanwhile, a similar "Waste Bank" on a country-wide scale may provide large savings of funds and alleviate some production problems. Certainly the time has come to think about creation of a large sub-division at, say, the USSR State Supply or within the framework of the scientific-technical information service of the USSR State Committee for Science and Technology, which has the capacity to solve this problem. It would be enough to equip an information system on an EVM base and printing devices for periodic publication of a bulletin. I believe that expenditures on this would be repaid with interest.

2791

CSO: 1841

USSR

UDC 65.012.2:66"71"

**PROBLEMS IN METHODOLOGY AND METHODS OF PLANNING THE TERRITORIAL DEVELOPMENT OF THE CHEMICAL INDUSTRY**

**Moscow** *KHIMICHESKAYA PROMYSHLENNOST'* in Russian No 7, 1979 pp 441-444

**TRUTNEV, N. A.**

[Abstract] When planning the placement of chemical industry the material, manpower and financial resources of the region, the advantages of developing that area of the regional economy which has the most favorable natural and economic conditions, regional specialization and regional economic interrelationships must be considered. These must be matched with industrial raw material, energy and water requirements. Transportation factors, technological progress such as waste-free technology and possibilities of consolidation should be included. Considering the unity of the nation's economy requires a deeper and wider work-up of the plan. The regionally corrected expense is one of the most important factors for technical-economic calculations. Future trends need to be predicted and producer-consumer supply lines need to be studied.

USSR

UDC [66.012.52:661.212].002.237

**AN ANALYSIS OF CERTAIN SOURCES OF ECONOMIC EFFICIENCY OF AUTOMATIC TECHNOLOGICAL PROCESS CONTROL SYSTEMS FOR THE ROZDOL'SKIY MINING AND CHEMICAL COMPLEX**

**Moscow** *KHIMICHESKAYA PROMYSHLENNOST'* in Russian No 7, 1979 pp 413-414

**OGORODNIK, I. M., TSADIV, I. I. and KYSIL', S. I.**

[Abstract] Certain sources of economic efficiency in automatic technological process control systems were analyzed. The systems could raise the average coefficient of equipment utilization from 0.88 to 0.90 and increase autoclave utilization from 84% to 88.9%. Decreasing equipment idleness, increasing enrichment and autoclave utilization coefficients, increasing sulfur recovery during enrichment, lengthening the fusion cycle, coordinating the operations of the autoclave and enrichment facilities and optimizing the autoclave process can give a possible increased output of sulfur or 252,146 tons. Figures 2.



### BRIEFS

**LIQUID GAS--Ryazan'**--The employees of the gas-separating unit at the Ryazan' Oil Refinery are constantly concerned with upgrading the technology and up-dating the equipment. In particular, they have made a great effort to improve the quality of liquid fuel. The State Commission has rated it in the highest quality category. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Sep 79 p 2] 10,657

**SULFURIC ACID--Kirovgrad, Sverdlovskaya Oblast**--The sulfuric acid produced by the Kirovgrad Copper-Smelting Combine imeni Kirov has been awarded the Emblem of Quality. This product is outstanding for a high degree of purity, which was attained by the introduction of technical measures in the course of modernization of the sulfuric acid plant. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 28 Sep p 2] 10,657

**AWARDS FOR AMMONIA PLANT CONSTRUCTION**--By ukaze dated 17 August 1979, the Presidium of the USSR Supreme Soviet conferred orders and medals of the USSR to the most outstanding workers for their achievements in constructing the ammonia production complex at the Cherepovets Nitrogen Fertilizer Plant. The Order of the Red Banner of Labor was conferred upon 8 people, the Badge of Honor upon 12, the Order of Labor Excellence second class, upon 1, the Order of Labor Excellence, third class, upon 13, the "For Labor Prowess" medal was given to 22 and the "For Outstanding Labor" medal to 19 people. This ukaze is being published in the "Reports of the USSR Supreme Soviet" and Vologodskaya Oblast press. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 20 Aug 79 p 1] 10,657

**DUAL-PURPOSE PLANT--Volkhov, TASS--**Yesterday, a complex for the production of mixed mineral fertilizer was put in operation at planned capacity at the Volkhov Aluminum Plant. An important part of the socialist obligations of the workers of Leningrad and the Oblast for the 4th year of the current Five-Year Plan was fulfilled before the target date. The enterprise is successfully taking on a "second occupation." Along with increasing production of aluminum, used in products most of which have been awarded the "Honorary Pentagon" emblem, the metallurgists have mastered production of double superphosphate. It is produced in granules with a high concentration of nutrients. The plant personnel has expanded the chemical shop and installed complicated technological equipment within a short period of time. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 Oct 79 p 1] 10,657

**FIRE STOP--**A phosphate-base oil has been invented in the petroleum laboratory of the All-Union Heat Engineering Institute imeni Dzerzhinskiy. Its igniting temperature in an open fire is 400°C. But even at such a temperature, the flames do not spread, as the jet of oil extinguish them. This new oil is already in use at the Kama Automobile Plant, Moscow Automobile Plant imeni I. A. Likhachev, Leningrad Optical and Mechanical Association and several other enterprises in our country. It reduces fire hazard to a minimum. [Text] [Moscow TRUD in Russian 11 Oct 79 p 2] 10,657

**INDUSTRIALIZATION OF IRTYSH RIVER AREA--Tobol'sk--**The suburbs of Tobol'sk, this ancient city on the Irtysh River, are acquiring an increasingly industrial appearance. A huge petrochemical complex, the future "flagship" of Siberian petrochemistry, is being erected by thousands of workers who have converged here from all corners of our country. The Severnaya raw material stock base is expected to go on stream in the fourth quarter of this year, and this is the first starting project of the petrochemical complex. [Text] [Moscow IZVESTIYA in Russian 19 Jul p 1] 10,657

CSO: 1841

USSR

THE GENERAL CHEMICAL ENGINEERING COURSE AND THE MAIN DIRECTIONS OF ITS DEVELOPMENT

Moscow TEORETICHEMSKYE OSNOVY KHIMICHESKOY TEKHNologii in Russian Vol 13, No 4, Jul/Aug 79 pp 483-485

ZHAVORONKOV, N. M. and AMELIN, A. G.

[Abstract] Soviet chemical engineering training includes general theoretical, chemical technology and special topics courses. The chemical technology course consists of basic processes and apparatus of the chemical industry and general chemical technology. The new chemical technology course is divided into basic principles, reactors, raw materials, water and energy and manufacturing types. Mathematical modeling, general principles of chemical reactions in industrial settings with well developed, concrete examples, system analysis, process organization, reactor principles, close correspondence with physical chemistry concepts and laboratory are included. Laboratory practice still needs to be improved and modernized. The course should be reorganized to reflect general theories of the form of chemical processes on the industrial scale. References 4 Russian.

USSR

UDC 628.543.5.002.237

## HIGH-SPEED BIOLOGICAL PURIFICATION OF LIQUID WASTES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 8, 1979 pp 468-459

VORONENKO, V. V., USMANOVA, L. P. and NAUMOVA, R. P.

[Abstract] Laboratory experiments with high-speed destruction of model mixtures of organic matter of various structure, present in industrial liquid wastes, by means of a mixed bacterial culture on using unlimited quantities of oxygen and substrate, are presented. The experiments were conducted in a uniflow-type fermenting tank with a pneumomechanical aerating device. The tank was charged with biological sludge and with the wastes to be purified in proportions determined experimentally as a function of the nature of the wastes present. Biogenous elements-- ammonium sulfate and potassium phosphate--were added in the ratio COR [Chemical Oxygen Requirement]:N:P = 100:5:1. The growth of the biomass was monitored according to the change in the optical density of the solution. Comparison of the indicators of such high-speed biological purification of model mixtures and industrial liquid wastes with analogous indicators for traditional biological purification demonstrates the possibility of increasing the permissible load per unit volume of aerated space by an order of magnitude and more compared with the traditional method. The microorganisms existing in a state of active growth can evolve into highly active populations capable of rapidly adapting and readapting themselves to the compounds to be broken down. Owing to the marked exothermal effect accompanying the breakdown of the organic compounds, the process can take place at high temperatures (35-37°C) without the need to supply outside heat. A major requirement is the assurance of an adequate oxygen supply rate during the liquid phase. References 5: 3 Russian, 2 Western. [06-1386]

BIOCHEMICAL PURIFICATION OF THE LIQUID WASTES OF ACTIVE- AND DIRECT-DYESTUFF PRODUCTION FOLLOWING TREATMENT WITH SODIUM HYPOCHLORITE AND CHLORINE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 8, 1979 pp 467-468

ENDYUS'KIN, P. N., BUINOVA, N. I., DYUMAYEV, K. M., FILIPPOV, V. M. and SELEZENKIN, S. V.

[Abstract] Treatment of the liquid wastes of active- and direct-dyestuff plants with sodium hypochlorite or chlorine results in converting the organic compounds present in the wastes (in quantities of 2-4 g/liter) to, chiefly, carboxylic acids. In this connection, the possibilities for a subsequent biochemical purification of these wastes were explored by diluting them with waters from primary settling tanks of industrial biological waste-treatment facilities in ratios of 1:200, 1:150, 1:100, 1:75, and 1:50, in aeration tanks. Aeration time was 18 hour; sludge concentration, 3-3.5 g/liter; air consumption rate, 30 m<sup>3</sup> per m<sup>3</sup> of wastes. The experiment lasted for 6 months and the results were assessed according to findings of sanitary-chemical and microbiological analyses. It was established that dilution in the ratios 1:75 was most effective and that then the degree of purification of the dyestuff production wastes reached 88-96% in terms of the rate of chemical oxygen requirement and 89-98% in terms of the rate of biological oxygen requirement, thus demonstrating the success of the experiment. Microscopic analysis of the left-over active sludge revealed that its microfauna was chiefly represented by Opercularia glomerata, Epistylis, Vorticella convallaria, Philodina, Stylonichia, Notommata. [06-1386]



CENTRAL COMMITTEE CREATES NEW AGROCHEMICAL INSTITUTE

Moscow TRUD in Russian 2 Sep 79 p 4

[Unsigned article "Agrochemical Center of Russia"]

[Text] The CPSU Central Committee and the USSR Council of Ministers has adopted a decree "Creation of A Unified, Specialized Agrochemical Service In The Country." Measures associated with its creation provide for the organization this year of the All-Russian Scientific Research and Technological Design Institute of Chemization of Agriculture. The institute will begin operation in the settlement of Nemchinovka near Moscow where a major agrochemistry center is being established. The tasks entrusted to the new scientific institution were related to the "Trud" correspondent by Head of the Main Administration of Chemization of the PSFSR Minister of Agriculture A. Postnikov.

The institute will be established at the site of the republican control agrichemical laboratory, the organizer and first director of which happened to be me. Incidentally, there now are 115 laboratories and chemization stations and thousands of farms of different rayons and oblasts of Russia obtaining scientific and technical assistance from Nemchinovka.

Problems of chemical reclamation of soils, skillful use of fertilizers, checking the quality of agricultural production and fodders do not nearly exhaust the list of problems which will occupy scientists of the institute. We cannot dwell here on problems of environmental protection under the conditions of intensive use of means of chemization of agriculture.

Our country occupies first place in the world in the volume of production of chemical fertilizers. We face the task of ensuring a maximal effect from the vast state expenditures for these purposes. One of the conditions of this task is the improvement of the efficiency of fertilizers. This occupies scientists of two departments of the institute -- the Department of Nutrients in Agriculture and the Department of Agrochemical Soil Science. Soil samples from different regions of the republic will

be sent to them systematically for checking. The scientists will conduct scrupulous studies of these samples, will check the correctness of observance of technique and will give on the spot recommendations for use of these or those fertilizers. Nemchinovka will have its own experimental section for study of the nutrient balance of soil and the uptake of nutrients by plants.

Until now, the establishment of a supplies and equipment base of chemization at the village level lagged greatly behind the rate of growth of supply of fertilizers. In connection with this, a considerable part of them are stored in unadapted premises and even in the open and are damaged. The village needs a high-productivity technique for intra-warehouse processing of fertilizers and the transportation and application of them. Modern warehouses must be built. Moreover, the traditional materials such as brick and reinforced concrete should be replaced by wooden glued structures which are less subject to the destruction effect of chemicals. This will also reduce construction costs and shorten the time required for construction. These important problems will be solved by technical design departments of the institute.

Teletypes which ensure reliable 2-way communication between scientists and specialists of kolkhozes and sovkhoses already permit rapid and specific transmission of information required. In a new section, which is already being built for the institute, will be installed an EVM [electronic computer] for processing data obtained from the field and the results of experiments of scientists. Its memory bank will contain information concerning the effect of fertilizers under different soil and climatic conditions and under different levels of intensification. Selection and distribution of recommendations will be made on the spot with the help of the "Khimizatsiya [Chemization]" automatic control system.

The technological plan of workers of installations and laboratories of the institute was created in collaboration with scientists, technologists and designers of Eastern Germany and Hungary. Improved equipment will assist in the effective introduction of scientific information. The new wing will also include living quarters for associates of the institute. Erection of a residential complex with a library, a clubhouse, a pool, a sport's arena and a theater is being completed.

The agrochemical center of Russia is growing in Nemchinovka.

2791

CSO: 1841

USSR

UDC [661.635.213+661.635.223].002.612.3-911.4:532.13

THE EFFECT OF COMPOSITION AND TEMPERATURE ON THE VISCOSITY OF  
NITROAMMOPHOS AND NITROAMMOPHOSKA MELTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 409-411

KONONOV, A. V. and STERLIN, V. N.

[Abstract] Simplex lattice planning was used to study the dependence of  $\text{NH}_4\text{NO}_3$ - $\text{NH}_4\text{H}_2\text{PO}_4$  (NP) and  $\text{NH}_4\text{NO}_2$ - $\text{NH}_4\text{H}_2\text{PO}_4$ -KCl (NPK) melts on composition at 170°, 175° and 180° for 3.5 and 10 minutes. An equation characterizing the dependence of NPK melt viscosity on initial composition was obtained and coefficients for various temperatures and interaction times were tabulated. Lines of equal viscosity were constructed. NPK melt viscosity rises sharply on increasing KCl concentration above 10-15%. The viscosity of the 2:1:1 melt decreases with increasing temperatures and somewhat increases with increasing contact time, probably due to interaction between KCl and  $\text{NH}_4\text{NO}_3$ . However on increasing potassium concentration (as in a 1:1:1 melt) viscosity increases with both temperature and contact time, possibly because of a reaction between KCl and  $\text{NH}_4\text{H}_2\text{PO}_4$ . This is similar to previous findings on surface tension. Figures 5; references 8: 7 Russian, 1 Western.

USSR

UDC 661.53:66.097.3.003.13

A METHOD FOR EVALUATING THE ECONOMIC EFFICIENCY OF VARIOUS TYPES OF  
AMMONIA SYNTHESIS CATALYSTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 415-417

KUZNETSOV, L. B., MIKHAYLOVA, S. A., BRITINA, G. A. and SUVOROVA, V. A.

[Abstract] Improvements in ammonia synthesis when the standard CA-1 catalyst is partially replaced by other CA type catalysts are discussed. The CA-1B catalyst, which is a spherical prereduced granule, improves gas flow distribution leading to a 5-10% increase in productivity. Pre-reduced catalyst shortens preparation time. High activity catalysts CA-1H and CA-2 can be layered with catalyst CA-1 to give a 5-15% increase in productivity with improved synthesis column stability. Taking gas purity into account the use of prereduced catalyst is calculated to save 54,000 rubles per year. The technological parameters for high activity catalysts are calculated for four variants: increased ammonia in column effluent, decreased consumption of fresh gas by increasing inert components

but conserving productivity, or conserving gas consumption and decreased use of electricity as a result of decreased load on the secondary condenser. The economic effect is calculated by summing the expenditures for fresh gas and cooling, conditionally-fixed costs and the cost of carrier gases and multiplying by aggregate productivity. The greatest economic effect is achieved if synthesis is the limiting step and productivity is increased by increasing the load on the gas preparation steps. Increasing the amount of ammonia entering the catalyst column is most efficient. References 13 Russian.

USSR

UDC 631.893.123(047.1)

#### MAJOR TRENDS IN THE DEVELOPMENT OF METHODS FOR THE PRODUCTION OF CARBAMIDE-CONTAINING COMPLEX FERTILIZERS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 8, 1979 pp 470-473

SARBAYEV, A. N. and POLYAKOVA, Z. A.

[Abstract] By 1980 the deliveries of mineral fertilizers and chemical feed additives to agriculture should increase to 115 and 5 million tons, respectively, while during the 1981-1985 period they are scheduled to increase to 135-140 and 7 million tons, respectively. In this connection the developmental trends for the production of carbamide-based complex fertilizers are surveyed and the history of that production is reviewed. American, Japanese, West European, and Soviet patents are described. On the basis of this examination it is concluded that currently the processing of both solid carbamide and semifinished carbamide products is widespread. As for the production of ammonium phosphates, the most suitable raw material is phosphoric acid, which in most cases gets ammoniated in the process of the synthesis of NP- and NPK-compositions. In analyses of the economic expediency of establishing facilities for the production of carbamide-containing compositions allowance should be made for availability of raw materials, power, manpower, and other resources as well as for the feasibility of the proposed technological processes and the actual availability of equipment. Compared with the production of fertilizer mixtures at comparatively small stations, the industrial production of complex multicomponent fertilizers under precise conditions is much more economical and preferable. Any measures to the contrary should be considered as provisional. References 94: 27 Russian, 67 Western (including 60 in Russian translation) [06-1386]

**A STAGE-BY-STAGE EXERGETIC ANALYSIS OF A HIGH CAPACITY AMMONIA SYNTHESIS SYSTEM**

Moscow TEORETICHESKIYE OSNOVY KHIMICHESKOY TEKHNologii in Russian Vol 13, No 4, Jul/Aug 79 pp 600-603 manuscript received 4 Oct 77

SEMENOV, V. P., SOSNA, M. KH. and GOL'DINA, O. B., State Scientific Research and Planning Institute of the Nitrogen Industry and Products of Organic Synthesis

[Abstract] The exergetic loss at each technological stage of ammonia production was evaluated and its role in the effectiveness of the total scheme was determined. The energy efficiency coefficient (eec) was calculated for ten different stages, including indirect loss. A tubular furnace with a preboiler has an eec of 97.5%; without a preboiler the eec is 88.944%. Energy loss from irreversible fuel combustion is divided proportionally between the appropriate stages. The greatest exergy loss was found in the tubular vapor conversion, shaft exhaust conversion, CO<sub>2</sub> removal purification and ammonia synthesis stages. Residual methane from hydrogen, carbon monoxide and carbon dioxide contributed to nonproductive exergy loss. Thermodynamic analysis indicates that the methane conversion, ammonia synthesis, carbon dioxide removal and carbon oxide conversion stages have the greatest reserves for increasing effectiveness. Dosing with pure nitrogen isolated from air can increase the eec. The exergetic eec was found to be 0.75142 and the total eec 0.503. Figures 2, references: 6 Russian.



## NESMEYANOV DISCUSSES PROGRESS IN SYNTHETIC FOOD

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 11 Sept 79 p 3

By ukase of the presidium of the USSR Supreme Soviet Academician A. N. Nesmeyanov, a Hero of Socialist Labor, was awarded the Order of Lenin and a second "Hammer and Sickle" gold medal for distinguished services in development of Soviet science and training of scientific personnel, in connection with his eightieth birthday. A bronze bust will be erected at the distinguished scientists' birthplace.

[Text] In the words of Aleksandr Nikolayevich Nesmeyanov himself, he considers the raising and development of the problem of obtaining synthetic and artificial food the main thing that he has been able to accomplish in his life.

This problem was first presented to a wide scientific audience in 1965: the 9th Mendeleyev Conference on General and Applied Chemistry, at which Nesmeyanov gave a report, was being held in Kiev. It cannot be said that his ideas were received without doubts. Raising protein in the form of yeast on petroleum paraffins and then transforming it into meat, fish, macaroni, even black caviar? To many this plan seemed fantastic. Even the first results of work in this field--in the form of artificial black caviar--shown to the scientists could not melt the ice of scepticism.

But there was also something else: general admiration of the boldness of the project and the profound development of the idea. It is no slight to the other speakers to say that in those days the discussions in the corridors most often centered on Nesmeyanov's speech.

In a conversation with Aleksandr Nikolayevich on the eve of his birthday I ventured to ask him whether he thought that production of synthetic food would completely replace agriculture in the future.

"If you were not a journalist...", Nesmeyanov looked at me in obvious disbelief but still continued, "Yes, in my heart of hearts I think that in time--although it will not come soon--traditional agriculture will be forced to give way. In the meantime it is a question of helping it eliminate the shortage of food products which exists today in the world. And above all the shortage of such an important food component as protein. Despite enormous outlays of energies and resources, the traditional methods of producing food products are still not solving the problems: according to statistics nearly two thirds of the people on the globe are still systematically undernourished, and many of those who are not formally starving are suffering from different ailments caused by inferior nutrition."

You will agree that in order to undertake the development of such an age-old and basic problem of humanity as the problem of the food supply more than boldness of scientific thought is necessary. Here the rational approach of a technologist, the sober opinion of an economist and the scope of a talented organizer are also necessary. All these qualities, despite their apparent incompatibility, are generously united in the person of Nesmeyanov, although at the beginning of his life's journey Aleksandr Nikolayevich himself scarcely suspected it.

He arrived at Moscow University in turbulent year of 1917 with a firm intention of becoming a scientist. Here under the leadership of the illustrious N. D. Zelinskiy he began to work in the laboratory, here he went from being a student and graduate student to chairman of the department, dean of the chemical faculty and finally the head of MGU [Moscow State University]. Incidentally, Muscovites and visitors to the capital admiring the MGU complex in the Lenin Hills scarcely suspect that it is much indebted to A. N. Nesmeyanov for its appearance. It was he who, having heard by chance that it had been decided to build several tall buildings in Moscow, quickly sat down and wrote a letter with a sound suggestion: one of these buildings should become a university! The suggestion was accepted. And then came perhaps the hardest part: in debates on the most diverse levels he had to defend the new university in the form in which we see it today--built with regard for the future.

Nesmeyanov then had to fight for many things, defend still unbuilt laboratories and offices, auditoriums and dormitory rooms, to fight for each square meter. And then, when the construction began he had to obtain things, put pressure on people, convince people. But all these numerous cares could not tear him away from the main thing--scientific research. The founder of the Soviet school of element-organic compounds--a new field which had emerged at the junction of organic and inorganic chemistry--in those years he conducted a great deal of original research. And suddenly, unexpectedly even for many friends and comrades he sharply redirected the entire course of his work and concentrated all his energies in one direction.

"In the early 1950's when construction of the university was in full swing, Aleksandr Nikolayevich suddenly learned that English investigators had discovered a new, stable metalloorganic compound--ferrocene," Academician M. I. Kabachnik recalls today. "To many people the molecule of this compound seemed to be a wonder, a real freak: in it the metal atoms were grasped at the top and the bottom by carbon rings. But Nesmeyanov knew how to discern enormous hidden potentials in this sandwich structure. And he set all his coworkers to developing a new direction. And when after several years of intensive work they succeeded in obtaining a whole range of new, valuable substances, from combustion accelerators to medicines, many could only marvel at Aleksandr Nikolayevich's rare gift: his ability to anticipate, to recognize behind what would seem to be common facts what he calls 'growth centers'--sources of great future challenges."

Today the idea that great discoveries are, as a rule, born at the junctions of the sciences has been confirmed on a great number of examples, but Nesmeyanov had come to this conclusion in the 1950's.

"Science can be compared to an endlessly growing and branching fruit tree," he said. "Just as the tree develops predominantly at growth centers, so science at different stages has its 'growth centers' where progress occurs particularly rapidly. For this reason it is here that basic energies and resources should be drawn up, as if to develop a break-through to the front. Such 'growth centers' most frequently are at the borders of contact between different sciences where one science penetrates the other, enriching it with its methods and injecting new blood. This is a natural phenomenon. Along with mutual penetrations of the sciences, their profound differentiation and demarcation is occurring before our very eyes. But these are interrelated processes. It is impossible to obtain linen fabric without first carding flax fibers and spinning them into threads. In the same way these processes also facilitate the formation of the common fabric of science."

Having become president of the USSR Academy of Sciences in 1951, Nesmeyanov spared neither time nor energy in transforming this idea into reality. With his support and participation nearly 20 new academic institutes were created, the majority of which lay precisely at the junctions of the sciences. But the first of them to appear was an institute which, as it seemed to many people at that time, was not of paramount significance--the All-Union Institute of Scientific and Technical Information (VINITI).

"It is today, when a state scientific-technical information service has been created in the country, when there are information centers and institutes in each ministry, when automated, computer-based information systems are already in operation that the organization of VINITI looks like a completely natural step," relates Academician M. I. Kabachnik.

"But then... Then it was necessary to have Aleksandr Nikolayevich's rare gift of foresight in order to recognize the threat of the imminent 'information explosion', of that endless stream of information about new discoveries and developments that today accompanies scientific and technical progress. Nesmeyanov did not simply become the initiator of the creation of the institute of information; under his leadership publication of REFERATIVNYY ZHURNAL [Reference Journal] was begun. Scientists and engineers can no longer conceive of their activities without its laconic abstracts and notes."

The features not only of a great scientist but also of an organizer of science who clearly presents its role in the life of contemporary society can already be traced in these sparse strokes in Nesmeyanov's portrait. In comprehending the path from scientific information--a trampoline for the emergence of new ideas--he could not fail to arrive at the terminal point: the practical realization of the results of investigation. Even then, nearly a quarter of a century ago, Aleksandr Nikolayevich showed the advisability of division of labor as scientific ideas progressed into practice, advocated strong ties between science and production. In his opinion, when a clear technical result is obtained in an academic laboratory, the branch institutes and the KB [design bureaus] should join in the further development of the problem. At the stage of transmitting innovations to production the plant laboratories should also join in; he has always fought for the strengthening of the research potential of their laboratories.

And today, according to the accounts of his coworkers Aleksandr Nikolayevich never tires of stressing the necessity of "extending" scientific ideas not only horizontally--in related branches of science, but also vertically--in practical life and in production. And by his own example he is attracting others to this, let us be blunt, thorny path. The confirmation of this is his approach to the same problem, synthetic food.

Listening to Nesmeyanov's reports on this subject, people remote from sciences may easily fall into doubt: who is he--a physician, a chemist, a biologist, economist or technologist? Their doubts are easily to understand: the scientist and his comrades are developing every aspect of this most complex problem from all positions. The thread of their reasoning is logical to the utmost: it is not just a question of a shortage of protein; its composition is also important. By amino acid content human mother's milk may be considered the ideal food. The amino acid balance in proteins of animal origin is also acceptable and that in plant proteins, much worse.

Does this mean that by using plant proteins in the form of fodder for cattle we are on the right track? Not at all: estimates demonstrate that 8.5 kilograms of protein, 60 kilograms of carbon and 5 kilograms of fat expended in animal husbandry give a total of 1 kilogram of protein in the form of meat and 1 kilogram of fat. And the carbon is practically completely lost in the process. This is something to think about, isn't it?



"As you can see, the losses of protein are nearly 90 percent," says Aleksandr Nikolayevich. "This is why the goal of eliminating the middle link--the animal--in the chain "fodder-animal-man" is so economically enticing. Work in this direction is being conducted in many countries of the world. In the GDR, for example, research on transforming the proteins of plant wastes into food has been developed in contact with us. In England a method for obtaining milk from the protein of alfalfa, bypassing the cow, has been developed. In the USA chicken meat, ham and meat dishes are being prepared from soy protein. But in our opinion there is also a more promising path based on the use of yeast, grown, for example, on the paraffin fraction of petroleum. By amino acid content, this microbiological protein is sufficiently good. And the productivity of microorganisms is many times higher than that of animals and birds. Let's say in 24 hours a ton of yeast can yield 1000 tons of "progeny" containing 400 tons of protein. Of course, in order to learn how to transform yeast protein into full-fledged food it is necessary to solve a great number of individual problems. But the approach to them is already known in principle.

The laboratory of the Institute of Element-Organic Compounds of the AN SSSR [USSR Academy of Sciences], where this research is being conducted at times is reminiscent of a culinary shop. Here they are learning how to transform a nutritious but unattractive white protein powder into complete likenesses of meat and fish, the rice grain or slices of potato, to give these dishes the corresponding taste and aroma, consistency and appearance. Many samples created here practically cannot be distinguished from the natural food. Their mass production could be started. But meanwhile stringent testing awaits them. This is no place to talk about delays, for here it is a question of a challenge commensurable with the nuclear or space challenges.

It is said that true talent is not liberal in one thing alone. I have heard from many people that Nesmeyanov loves the theatre, has an interest in poetry and himself writes verse, some of which has been set to music by his wife Marina Anatol'yevna. But when a scientist takes brush in hand at a mature age can he count on success? Meanwhile, as many affirm, Aleksandr Nikolayevich's landscapes are distinguished by an overwhelming love for nature. What is the secret? Perhaps it is that Nesmeyanov approaches whatever matter he undertakes with the utmost responsibility? Perhaps not this alone. I think that here his own words on what a modern scientist should be like may serve as an answer:

"I think that the main quality of a scientist is love, an insatiable interest in the mysteries of nature and in ways to master these mysteries. All the rest will come. Also required of the scientist are enormous daily labor, the labor of his entire life and enormous brain work, patience and a gradual ascent to the summits of science, which reveal increasingly more distant horizons. But all this is easy for a man in love. Without the acute interest of a lover, there is no scientist."



## SILICONE RUBBER MEMBRANE HELPS TO PRESERVE FOOD

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Oct 79 p 4

[Article by Ye. Ponarina, "To Stock Up on Preserves"]

[Text] Would you like to preserve the harvest of autumn, as fresh as if it were used right from the bush or field? Then you must watch for the time when lids for SKAN-1 canning will be put on the market; the Moscow Plant of Consumer [household] Chemistry is refining production of such lids.

What sort of lids are these, about which people who like to put up canned fruit and vegetables have already heard? They differ little in appearance from the plastic lids that we use daily to cover glass jars. But there are several round holes on the outside and a dense polymer net on the inside....

One of the inventors of these lids, A. Nikitayev, candidate of agricultural sciences, says: "The holes are to let air in. The usual methods of putting up preserves involve protection of the product from oxygen of air, even metal lids are beaded with a special machine to provide for a better seal. But in this case, on its way into the jar the air encounters a gas-exchange membrane. And it is the secret...."

For centuries, the inquisitive human mind has been struggling over a problem over all problems: how to preserve the harvest that was raised and gathered with such difficulty? A multitude of methods was conceived, but all are far from perfect. In the drying process aromatic and extractive substances escape, ascorbic acid and carotene are broken down. In the boiling process, essential amino acids perish, yet without them many substances essential to the body are simply not assimilated. Even cold, the last hope, offers only a seeming effect: only half the vitamins remain in frozen foods, many valuable nutrients break down into less useful ones, the food loses moisture and flavor, and also its good appearance after being exposed to warm temperatures.

The entire difficulty of storing vegetables and fruit lies in the fact that once they have been removed from the tree or field they continue to live: metabolic reactions occur in the cells of the fruit, it breathes, taking up oxygen and discharging carbon dioxide. To stop these processes would mean that the fruit would be ruined and, along with it, its valuable contents. If they are not stopped, the fruit begins to wither and rot, being deprived of influx of nutrients from the roots. Thus, we see that the harvest can be preserved by only one method, by learning to literally tread on the boundary between life and death.

What must be done for this? Graphically speaking, the fruit should be changed into a state of anabiosis. In other words, we must provide storage conditions, under which the biochemical reactions in cells would be at a minimum of activity, energy expenditure would be as economical as possible and respiration superficial.

Such conditions are provided by a combination of two elements, the first of which is still cooling. Only now, as it slows down metabolic processes in cells, the cold should not be deep enough to damage the fruit. The second element helps in this respect, a controlled gas environment surrounding the fruit. In it, the oxygen content, which is the main culprit involved in perishing of fruit and vegetables, must be reduced to a minimum. The fruit itself create such a gas environment under the SKAN-1 lids. And it is aided in this by a membrane, which has the appearance of a piece of sail-cloth.

S. Kalachov, chief designer, tells us: "This membrane, which is based on organic silicone rubber, selectively allows gas components to pass through it. If a jar of fruit is covered with a lid with such a membrane, the fruit will continue to breathe, to take up oxygen and discharge carbon dioxide. But there is virtually no access of oxygen from the outside. Its level in the jar will drop to 3-5%, versus 21% in the atmosphere. But the concentration of carbon dioxide will increase to 3-6%, whereas air contains hundredths of a percentage point."

"Let me add that the same membrane prevents drying of the fruit, retaining almost 100% moisture in the jar. As a result, apples remain whole and intact until the next harvest time. And such delicate items as strawberries and raspberries, which usually spoil in 2 days, can live in a jar with such a lid for over a month."

In addition to lids for jars, the specialists at the Central Experimental Research and Designing Technological Laboratory of Agricultural Chemistry have provided membrane "windows" for ordinary polymer packages and even shopping bags, in which berries purchased in the morning can be stored to the end of the work day without a refrigerator. The membranes have undergone successful testing as well in the capacity of gas-exchange filters for large storehouses. But scientists consider the containers they have developed, which range in capacity from 100 kg to several tons, to constitute a cardinal solution to the problem.

The smallest of these containers resembles a perforated [meshed] box, the bottom and walls of which are lined with a polymer film bag. It has no membrane "windows"; instead, there is a membrane of rigid construction, in the form of a vertical trunk with hollow "blades" with membranes branching out to the side. There are necks at the ends of the trunk, around which the bag is drawn tightly shut.

One can pack anything in such containers, from peaches and bananas to potatoes and parsley. And, it was the intention of the developers of the containers that this be done directly where the harvest is gathered; for the items do not have to be either washed or heat-treated, one has only to pick fruit or vegetables that are not bruised. As shown by experiments, they tolerate well 24-h transportation in such containers, even at temperatures of up to +35°. They can be stored for a long time, at temperatures of +1 to +5°, in the same containers, "assembled" into stacks. The food-stuffs should be delivered to the retailers in the same containers also....

All this is indicative of a basically new approach to gathering, transporting, storing and selling fruit and vegetables. The results of the experiments speak for themselves. Potatoes keep for 220 days in the new containers, onions and black radishes keep for 210 days, apples for 190 days and garlic keeps for a record time of 250 days! Here are the estimates of economists: it costs an average of 7-12 rubles to store the product in such a container. This means that in order to solve the problem of supplying garlic to a city like Moscow, one must spend 40,000 rubles for the production of "bladed" membrane devices and containers. But they promise to save over a million rubles. For apples, the respective figures would be 5 and 90 million rubles.

But this does not exhaust the potential of membranes. "Growth energy" is well-retained in seeds of different crops kept in such containers, then the plants ripen sooner and are less stricken by disease. As a result, the potato yield increases by an average of 25-30%. Such problem "passengers" as southern flowers also feel well in such containers with modified gas environment. They can be sent even to the Extreme North by rail, motor vehicle or water.

There is another experiment that we cannot fail to report: it was conducted directly in the field, where researchers permeated an enormous pit with sugar beets with the membrane "blades" and covered it with polymer sheeting.

The specialists now recall with a smile: "We were afraid most of all that field mice, which love polyethylene, would gnaw through the sheet and open the pit. But the mice approached the sheet, smelled it and ran the other way. It turned out that they are very sensitive to gases, including carbon dioxide, in an atmosphere of which it is impossible for them to breathe."

The experiments have already progressed beyond the laboratory stage. At the present time hundreds of tons of vegetables and fruit are being stored under the protection of membranes in Moldavia, the Kiev region, Moscow suburbs and the capital itself, as well as other parts of the country.

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CSO: 1841

USSR

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IONIC DISSOCIATION AND COMPLEXING PROPERTIES OF  $\alpha$ -OXY- $\gamma$ -DIMETHYLAMINO-  
PROPYLIDENE-DIPHOSPHONIC ACID

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8,  
1979 pp 1726-1730 manuscript received 31 Mar 78

KABACHNIK, M. I., BEL'SKIY, F. I., KOMAROVA, M. P., SHCHERBAKOV, B. K.,  
MATROSOV, YE. I., POLIKARPOV, YU. M., DYATLOVA, N. M., MEDVED', T. YA.,  
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[Abstract] On the basis of interpretation of the data of IR spectra in  $H_2O$  (900-1600  $cm^{-1}$ ) and  $D_2O$  (700-1200, 2700-3700  $cm^{-1}$ ) the order of ionic dissociation of  $\alpha$ -oxy- $\gamma$ -dimethylaminopropylidene-phosphonic acid is determined. It is shown that, like most acids of its type, this acid has a zwitter-ion structure. Further, the complexing of this acid with certain cations of alkali, alkali-earth, and transition metals as well as rare-earth metals was investigated. It was established that introduction of the amino group into the molecules of oxyalkylenediphosphonic acids does not affect the stability of normal complexes of the investigated metals; the stability of protonized complexes, on the other hand, then increases by roughly two orders of magnitude. The resulting complexes display a high solubility. Figure 1; references 15: 11 Russian, 4 Western.

USSR

UDC 542.91:547.558.6'161:541.49:546.92

CERTAIN REACTIONS BETWEEN PENTAFLUOROPHENYLIC HYDROGERMANES AND  
TRIPHENYLPHOSPHINIC COMPLEXES OF PLATINUM

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian  
No 8, 1979 pp 1854-1858 manuscript received 28 Mar 78

BOCHKAREV, M. N., MAYOROVA, L. P., SKOBELEVA, S. YE. and RAZUBAYEV, G. A.,  
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[Abstract] The reactions between pentafluorophenyl hydrides of Ge and the complexes of  $PtL_3$ ,  $PdL_3$ , and  $NiL_4$  ( $L = PPh_3$ ) were investigated and it was found that these complexes readily enter into an oxygenation reaction with tris(pentafluorophenyl) germane. The resulting hydride complexes of Pt, Pd, and Ni represent colorless or pale-yellow crystalline



substances. Their Pt-H groups display a low reactivity. The reaction between  $\text{HPt}(\text{PPh}_3)_2\text{-Ge}(\text{C}_6\text{F}_5)_2\text{-Ge}(\text{C}_6\text{F}_5)_2\text{H}$  and diethyl mercury resulted in the synthesis of a stable complex with the chain Pt-Ge-Ge-Hg. The yields of the Pt and Pd hydrides were 62 and 17%, respectively.  $(\text{C}_6\text{F}_5)_3\text{GeNiL}_2\text{H}$  could not be isolated in individual form, but its formation was corroborated by the appearance of reaction products of the band at  $2020\text{ cm}^{-1}$  in the IR spectrum (valent vibrations of the Ni-H bond). The experiments conducted showed that the synthesized hydrides do not catalyze the hydrogenation of hexene-1 at  $20^\circ\text{C}$  and at normal pressure. References 12: 5 Russian, 7 Western.

USSR

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#### PSEUDOALLYLIC REARRANGEMENT OF ACETOXYMETHYLPHOSPHINES

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 pp 1859-1862 manuscript received 24 Apr 78

TSVETKOV, YE. N., KRON, T. YE., the late MIRONOVA, Z. N. and KAPACHNIK, M. I., Moscow, Institute of Heteroorganic Compounds, USSR Academy of Sciences; Novosibirsk, Institute of Inorganic Chemistry, Siberian Affiliate of the USSR Academy of Sciences

[Abstract] The redox conversion of alpha-substituted phosphines to corresponding methylphosphine oxides, which the authors term pseudoallylic rearrangement, is of interest as a method for the synthesis of substituted oxides having a degree of functionality that is lower by a unit than in the original phosphines. This reaction is of special significance to the synthesis of bifunctional phosphine oxides and in particular their most elementary representative--methyldi(oxyethyl)phosphine oxide. In this connection, the pseudoallylic rearrangement of acetoxymethylphosphines which, unlike oxyethylphosphines, are readily purified by vacuum distillation, is investigated. It is shown that this reaction can be successfully used to synthesize acetoxymethylphosphines  $>\text{PCH}_2\text{OCOMe}$  which, on heating with glacial acetic acid (at  $180\text{-}190^\circ\text{C}$  for 8 hr) in the presence of acid catalysts, get rearranged into corresponding methylphosphine oxides  $>\text{P}(\text{O})\text{Me}$ . Of the catalysts used p-toluenesulfoacid (monohydrate) proved to be the most suitable. References 15: 7 Russian, 8 Western (1 translated into the Russian). [10-1386]

USSR

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INTERACTION BETWEEN 2,4,6-TRIISOPROPYL-1,3,5-DIOXAPHOSPHORINANE AND METHYL IODIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 pp 1863-1866 manuscript received 4 Apr 78

ARBUZOV, B. A., YERASTOV, O. A., IGNAT'YEVA, S. N., ZYABLIKOVA, T. A. and ARSHINOVA, R. P., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of the USSR Academy of Sciences

[Abstract] Considering that 2,4,6-triisopropyl-1,3,5-dioxaphosphorinane (I) exists in the form of a single stereoisomer with a chair configuration, equatorial (e) and isopropyl groups, and an axial (a) H atom on phosphorus, it was of interest to determine the stereospecificity of the association of MeI with (I) and the completeness of alkylation. The reaction between (I) and MeI was conducted in benzene at 20°C for 20-48 hr. NMR  $^{31}\text{P}$  spectra of the reaction mixture, 5-methyl-2,4,6-triisopropyl-1,3,5-dioxaphosphorinane (II) and of the solution of (II) in MeI show that completeness of alkylation upon the reaction between (I) and MeI depends on the reactant ratio: in the presence of excess MeI alkylation is thorough. (II) and its sulfide and oxide were isolated in the form of individual stereoisomers or their mixtures. The structure of the stereoisomers was determined, as was the conformational free energy of methyl on the protonized phosphorus atom in the (I) cycle. Figures 2; references 13: 7 Russian, 6 Western.

USSR

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SYNTHESIS OF  $\alpha, \alpha'$ -BISDIALKYLPHOSPHONISOPROPYLNITROXLS

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 pp 1867-1868 manuscript received 14 Nov 78

SKOROBGATOVA, M. S., MUKHTAROV, A. SH., LEVIN, YA. A. and IL'YASOV, A. V., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of the USSR Academy of Sciences

[Abstract]  $\alpha, \alpha'$ -bisdialkylphosphonisopropyl nitroxyl radicals were separately isolated by means of thermolysis of  $\alpha$ -nitrosodialkylisopropylphosphonates. Their IR spectra turned out to have bands characteristic of methyl and diethylphosphonic groups and of the nitroxyl fragment

(1345  $\text{cm}^{-1}$ ), and their electron spectra revealed a bathochromatic displacement of two longwave absorption bands compared with di-tert.butyl-nitroxyl. The separate isolation of these radicals was possible owing to their content of 2  $\beta$  atoms of phosphorus, and the thermolysis resulting in their isolation consisted in heating nitroso compounds in vacuo in order to eliminate the relaxed nitric oxide. References 5: 3 Russian, 2 Western. [10-1386]

USSR

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#### SYNTHESIS OF TRIALKYL(DIALKOXYPHOSPHORYLIMIDO)PHOSPHATES

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian  
No 8, 1979 pp 1884-1886 manuscript received 18 Jan 79

KHODAK, A. A., GILYAROV, V. A., SHCHERBINA, T. M. and KABACHNIK, M. I.,  
Moscow, Institute of Heteroorganic Compounds, USSR Academy of Sciences

[Abstract] Trialkyl(dialkoxyphosphorylimido)phosphates (I) display herbicidal and defoliant properties. Previously they could be synthesized chiefly by means of azides of phosphoric acids and trialkylphosphites--that is, by a dangerous technique owing to the toxicity of the azides of phosphoric acids. In this connection, in view of the existence of the known method of synthesis of tributyl(dibutoxyphosphorylimido)phosphate through the reaction between dichlorophosphorylimidotrichloride of phosphorus (II) and sodium butylate, the authors reacted (II) with sodium alcoholates in an alcohol medium, thus developing a safer technique for the synthesis of (I) (yield 40-90%). The identity of the thus synthesized (I) was corroborated by IR-spectral and chromatographic analyses. References 7: 6 Russian, 1 Western. [10-1386]

## REARRANGEMENT OF THE S-2-OXYALKYL ESTERS OF DIBUTYLTHIOPHOSPHORIC ACIDS

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 pp 1901-1903 manuscript received 13 Feb 79

NURETDINOVA, O. N. and GUSEVA, F. F., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of the USSR Academy of Sciences

[Abstract] Proceeding from the premise that the rearrangement of S-2-oxyalkyl esters of the acids of phosphorus occurs through the closing of the thiaoxaphospholane cycle, the synthesis of S-2-oxyalkyl esters of di-tert.-butylthiophosphoric acid (BTPA) was carried out. BTPA was synthesized from the corresponding ammonium salt by means of HCl. It was established that, whereas S-2-oxyalkyl esters of di-normal-butylthiophosphoric acid turn into O-2-mercaptoalkyl esters even before the synthesis is over, S-2-oxyalkylesters of BTPA undergo no such transformation. This is probably associated with the steric complications in the stage of the closing of the intermediate thiaoxaphospholane cycle. References 2: 1 Russian, 1 Western. [10-1386]

## INTERACTION BETWEEN ALKOXYPYRIMIDINES AND PHOSPHORUS OXYCHLORIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR. SERIYA KHIMICHESKAYA in Russian No 8, 1979 p 1910 manuscript received 26 Mar 79

GINIYATULLINA, M. A., PODZIGUN, G. I., REZNIK, V. S. and IVANOV, B. YE., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Affiliate of the USSR Academy of Sciences

[Abstract] It is shown for the first time that alkoxyprymidines react at 130-210°C with chlorophosphates and chlorophosphinates to form pyrimidine esters of phosphorus acid (yield 70-100%). This was accomplished when 17.1 g of 4.6-dimethyl-2-methoxyprymidine and 14 g of dipropylchlorophosphate were boiled in 50 cc of *m*-xylene until the release of CH<sub>3</sub>Cl ceased. The solvent was removed in vacuo and the residue was distilled. Similarly, 2.4-dimethoxyprymidines were found to interact with chlorophosphates and chlorophosphinates under the same conditions. [10-1386]

GASOLINE-WATER MIXTURE SUCCESSFULLY ROAD TESTED

Moscow IZVESTIYA in Russian 3 Oct 79 r 2

[Article by S. Afonin]

[Text] Scientists are working on a new type of fuel for motor vehicles.

A. Kalyuzhnaya, senior scientist at the Moscow Physicotechnical Institute, and V. Prostov, docent on the chair of molecular physics, showed me a test tube with a liquid that resembles milk.

"This is a new type of fuel," V. Prostov explained, "even though a significant part of it is water."

In the meantime, A. Kalyuzhnaya filled one container with gasoline and another with tap water. She added a small amount of oily fluid to each and stirred the mixture.

V. Prostov continued: "Specialists have estimated that the capability of the fleet of motor vehicles in operation in the national economy is several times greater than the capability of all our power plants. This is why aiding in saving fuel by all possible means is one of the most important tasks for scientists. The gasoline-water mixtures developed at the Moscow Physicotechnical Institute are also a step toward fulfilling this task. The new fuel has several advantages. We find that addition of water can increase drastically the octane number of the fuel mixture. In particular, it makes it possible to obtain, for example, from A-72 gasoline an analogue of the superior A-76."

Extensive tests made on buses at one of the motor transport facilities near Moscow revealed that the gasoline-water mixture lowers the thermal "stress" on the engine. Even in the hottest weather, the engines of buses did not overheat. The corrosive activity of the gasoline-water mixture does not exceed the permissible standards. This means that the new fuel will also prolong the service life of automobile engines.



Scientists have developed the technology for producing the new fuel for motor transport on an industrial scale. When, however, the "temperature barrier" problem will be solved (i.e., when the fuel mixture will not freeze at very low temperatures), there will no longer be any reasons that would delay extensive use of the new fuel in the national economy.

As we prepared for the trip home, we filled the tank of the newspapers automobile with freshly prepared gasoline "milk." The Volga engine ran smoothly and powerfully.

10,657  
CSO: 1841

USSR

UDC 665.65

PROBLEMS OF THE SUPPLY AND COMPLETE AND EFFICIENT UTILIZATION OF HYDRO-CARBON CRUDE FOR PETROCHEMICAL INDUSTRY

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 485-496

KALECHITS, I. V., USSR State Committee for Science and Technology

[Abstract] In view of the prospects for the continued growth of the petrochemical industry worldwide, that industry is expected to increasingly compete with power industry as a consumer of crude petroleum. Yet the extraction of crude oil is becoming increasingly less economical and its reserves are nearing depletion in the next 35-40 years. In view of this, science faces the urgent task of streamlining the utilization of hydrocarbon crude. This task should be accomplished in the following ways: 1) more sophisticated refining of petroleum; 2) use of non-petroleum raw material sources for chemical processing; 3) conservation of hydrocarbon crude through increase in selectivity and reduction in energy consumption of petroleum-refining and petrochemical processes; 4) development in the 1980s, and broad use in the 1990s, of processes for the production of synthetic hydrocarbon crude from coal. In all these general directions of technical progress a most important role can and should be played by the use of metal-complex catalysts, as seen from the standpoint of the author's own professional interests. The solution of the problems which the new trends in the supply of fuels and raw materials pose to chemists and power engineers is predicated on a marked expansion of catalysis research. Figures 5; references 33: 21 Russian, 12 Western. [20-1386]

USSR

DEVELOPMENT OF PETROCHEMICAL INDUSTRY IN AZERBAIJAN

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 518-522

ALIYEV, V. S., Baku, Institute of Petrochemical Processes, Azerbaydzheijan SSR Academy of Sciences

[Abstract] Azerbaydzhijan is one of the world's oldest petroleum regions and it contains chemical, synthetic rubber, and superphosphate plants in Sumgait, a tire plant in Baku, and the giant Sumgait Chemical Combine, among others. Petrochemical research in the republic started as early as in 1920 and its scientists were the first to, among other things, develop a highly effective fluidized-bed process for the hydroforming of butane into butylene, which served to sharply reduce the use of raw materials of agricultural origins and to reduce the cost and

expand the output of synthetic rubber in the USSR. Now petrochemical research is being undertaken at a number of specialized research institutes as well as university departments in the republic. The extensive reserves of hydrocarbon crude in the republic and the establishment of a caustic soda and chlorine plant in Sumgait have resulted in a vigorous development of the chlorocarbon industry in Azerbaijan. Another important branch of petrochemical industry to develop in the republic has been the upgrading of motor oils and other special-purpose oils by treatment with additives. The republic's scientists have moreover proposed a mathematical model of chemical plants with closed recirculation systems, and are working to develop and introduce automatic process control systems. Future trends include an increase in the production of ethylene by pyrolysis and a sharp increase in plastics processing. [20-1386]

USSR

UDC 66.092.147.3

PRESENT STATUS AND DEVELOPMENTAL PROSPECTS FOR THE PRODUCTION OF LOWER OLEFINS BY PYROLYSIS OF PETROLEUM

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 509-517

NOVAK, Z., NAMETKIN, N. S. and RUMYANTSEV, A. N., Berlin, Central Institute of Organic Chemistry, GDR Academy of Sciences; Institute of Petrochemical Synthesis imeni A. V. Topchiyev

[Abstract] The lower olefins (ethylene, propylene) are currently produced through the thermal decomposition (pyrolysis) of gaseous and liquid hydrocarbons in tubular reactors--pyrolysis furnaces. In this connection the design of the principal types of pyrolysis reactors and their specifications are reviewed. Future trends point to an increasingly greater reliance on the heavier fractions of crude as the raw material for pyrolysis, and this necessitates a more efficient utilization of crude. The most suitable method of processing for pyrolysis will be in-depth hydrodesulfurization. The pyrolysis facilities must be suitable for processing different types of fractions depending on the season, since in summer, e.g., surpluses of gas oil fractions can accumulate. Pyrolysis should be performed at less than 200°C to avoid the burnout of valuable recoverable constituents. Recent research points to promising new directions: 1) pyrolysis in a mixture with steam superheated to 2000°C; 2) pyrolysis on contact with flue gas that has a temperature of about 2000°C and is obtained on combustion of hydrocarbon fuel in a mixture with oxygen; 3) pyrolysis under pressure of steam methane, and hydrogen; 4) catalytic pyrolysis and pyrolysis in the presence of homogeneous initiating agents. Basic research into the process itself of high-temperature conversion of heavy fractions of crude, inclusive of techniques for processing the raw materials and efficiently utilizing all the products of pyrolysis, is needed. References 21: 6 Russian, 2 East German, 13 Western. [20-1386]

INVESTIGATION OF THE COMPOSITION AND STRUCTURE OF THE HYDROCARBON AND  
HETEROATOMIC CONSTITUENTS OF VACUUM GAS OILS IN LIGHT OF THE PROBLEMS OF  
IN-DEPTH PROCESSING OF CRUDE PETROLEUM

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 497-508

RADCHENKO, YE. D., POLYAKOVA, A. A., PEREZHIGINA, I. YA., CHERNAKOVA, G. N.  
and KHOTS, M. S., All-Union Scientific Research Institute of Petroleum  
Processing

[Abstract] Present-day principles of approach to the selection of optimal ways of processing petroleum crude so as to maximize the yield of petroleum products of the desired quality are outlined. To this end, in order to provide a sufficiently broad idea of the possible composition of crude, vacuum gas oils isolated from different varieties of petroleum (from deposits in Mangyshlak, West Siberia, and Arlan) were investigated. The different specimens were investigated by a combination of mass-, optical, and NMR-spectroscopic methods. Detailed analysis of the principle constituents of these gas oils served to infer specific conclusions as to their optimal processing. Thus, the vacuum gas oil (VGO) isolated from Mangyshlak crude, with its high content of paraffin hydrocarbons, is best processed by catalytic cracking into gasoline. The West Siberian VGO, with its high content of aromatic hydrocarbons and benzothiophenes, is suitable for processing into jet fuel (and fuel for supersonic aircraft) by means of hydrocracking. On the basis of the material balance and a detailed analysis of the composition of conversion products, the experimental data were subjected to statistical and kinetic processing which may serve as a basis for a mathematical description of the process. [20-1386]

THE DEVELOPMENT OF A MECHANIZED METHOD FOR PROTECTING STEEL STRUCTURES  
WITH INHIBITING LUBRICANTS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 417-419

YEMEL'YANOV, YU. V., KRAVTSOVA, V. YE., YLISEYEV, YU. G., KARETNIKOV, V. S.,  
LEBEDEVA, YE. YU. and KOROLEV, S. P.

[Abstract] Mechanized techniques for protecting steel structures with PVK-2 lubricant were developed. The lubricant was caused to flow by varying temperature and pressure and its rheologic properties studied using an elastoviscosimeter. It was found that viscosity changed more

with changing deformation rate at lower temperatures. Lubricant breakdown was seen at 50-70°C and no runoff was calculated to occur at 20-30°C. Lubricant spread on metal samples was 2 mm thick at the center of the spray jet and decreased to 0 by 15 cm from the center. Coating thickness varied from 2.0 to 1.5 mm at distances from the nozzle from 200 to 500 mm when the nozzle was moved 10 cm/sec. Pressures of 20-40 kgs/cm<sup>2</sup> gave coatings from .7 to 1.0 mm thick. The coefficient of diffusion of HCl vapors through the coating was determined on glass with metanil yellow and strongly increased above 300 mm from the nozzle and below 80° lubricant temperature. A temperature of 90-100° and pressure of 20 kgs/cm<sup>2</sup> are recommended. Figures 5; references 5 Russian.

USSR

UDC 661.787.13

THE SYNTHESIS AND ANTIKNOCK PROPERTIES OF HETERO-ORGANIC MANGANESE CARBONYL COMPOUNDS CONTAINING SILICON, LEAD AND TIN

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 400-401

CHERNYSHEV, YE. A., DMITRIYEV, A. S., MAGOMEDOV, G. K., SYRKIN, V. G. and LERNER, M. O.

[Abstract] The synthesis of tributylstannyl-cyclopentadienyl-manganese tricarbonyl (TBTCMT) and the results of antiknock tests on it and on trimethylsilyl-cyclopentadienyl-manganese tricarbonyl (TMSMT) and trimethyllead-manganese pentacarbonyl (TMLMP) are reported. TBTCMT was synthesized from  $\text{LiC}_5\text{H}_4\text{Mn}(\text{CO})_3$  and  $(\text{C}_4\text{H}_9)_3\text{SnCl}$  at -30° in tetrahydrofuran, with a 60% yield. After alumina column chromatography the orange liquid obtained was characterized by boiling point, refractive index, density, elemental analysis, IR, stability and solubility. TMSMT and TMLMP had antiknock properties higher than tetraethyl lead and lower than cyclopentadienyl-manganese tricarbonyl, while TBTCMT was significantly lower than the others.



USSR

UDC 66.094.37-911.4:[661.7:547.536.4'043]661.7:547.584

# THE PREPARATION OF PYROMELLITIC ACID BY THE LIQUID-PHASE AIR OXIDATION OF DUROL

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 390-392

NAZARENKO, YE. S., BOCOSLOVSKIY, YU. N., DIGUROV, N. G. and POLOTNYUK, O. YA.

[Abstract] The catalytic oxidation of durol to pyromellitic acid in a medium of acetic acid with the addition of monochloroacetic acid was investigated. The oxidation was conducted in a titanium column at 95°C. Gas-liquid chromatography showed that the maximum amount of monocarboxylic acid was produced in nine minutes, dicarboxylic acid in twenty minutes and tricarboxylic acid in fifty minutes. Increasing the temperature to 130° and the reaction time to nine hours gave pyromellitic acid in a 35% yield, while at 180° the yield was 36% after one hour. At 220° undesirable solids precipitated on the column. The addition of 6-10% (of total catalyst weight) manganese acetate to the cobalt bromide catalyst significantly raised the yield, up to 60%. When the catalyst concentration was lowered to 0.0175 mole/l the contamination of the product with metal ions, observed in previous experiments, was eliminated. At the lower catalyst concentration 10% manganese acetate gave a 78% yield after three hours at 180°. Nickel and chromium acetates were not effective. In the absence of monochloroacetic acid catalyst precipitation occurred in 15 minutes and the yield was 27%. When all concentrations and conditions were optimized an 84% yield was obtained. Catalyst recycling was not possible. Figures 3; references 10: 3 Russian, 7 Western.

USSR

UDC 534.222.2 + 662.612.1

# FEATURES OF THE COMBUSTION OF INFLAMMABLE LIQUID MIXTURES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 247, No 5, 1979 pp 1176-1179 manuscript received 22 Feb 79

BORISOV, A. A., GEL'FAND, B. YE., YEREMENKO, L. T., TIMOFEYEV, YE. I., and TSYGANOV, S. A., Institute of Chemical Physics, Academy of Sciences of the USSR, Moscow

[Abstract] The relationship between the combustible qualities of individual liquids and their qualities when mixed, such as ignition retardation, were measured according to temperatures and illumination. Hydrocarbons were mixed with hydrogen and alkyl nitrates such as ethyl nitrate. Illumination and temperature results indicated that the behavior of mixtures could be predicted only for the simplest hydrocarbons. References 4: 1 Russian, 3 English. [05-12131]

USSR

UDC 62-634.2:536.5.66.092.1

# TEMPERATURE OF INITIAL THERMAL DECOMPOSITION OF JET FUELS IN STATIC CONDITIONS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 7, 1979  
pp 16-18

BUKHARKIN, A. K., and KOVALEV, G. I.

[Abstract] The temperature of initial thermal decomposition of jet fuels was determined. The study was conducted in an autoclave type installation equipped with an in-process sampling accessory and an accessory for producing an atmosphere of desired composition in the space above the fuel. Fuel heating time was 240 min. Before the experiment, dissolved oxygen was removed by vacuum treatment and the autoclave bomb was purged with argon. The initial fuel concentration in all the experiment was approximately 1.5 mole/liter. Fuel samples taken during the experiments and the residue were analyzed as to iodine number and molecular weight; the residue was also tested for resin content. From the cracking of oxygen-free fuels in the 300-380°C range with prolonged duration (to 240 min), it was found that the vapor pressure remained virtually constant: total volume of gases formed did not exceed 0.3 liter/100 g fuel; only small changes in the iodine number and resin content in the fuel were noted. All fuels tested showed a slowing down of the cracking rate with time. For a constant experimental period of, for example, 60 min, all fuels began decomposing at an appreciable rate when the temperatures passed 400°C. Figures 2; tables 4; references 2 Russian. [96-10123]

USSR

UDC 62-631.2:543.876.004.4

# CHEMICAL STABILITY OF GASOLINES IN PROLONGED STORAGE

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 7, 1979  
pp 18-19

MALYSHEVA, I. V., AZEV, V. S., SAVIN, L. N., CHIZHIKOVA, YE. I., and KUZNETSOVA, L. N.

[Abstract] A standardized method of determining the chemical stability of gasolines when stored for a year in small containers is described: GOST 22054-76 "Gasolines, automotive and aviation. Method of estimating chemical stability." The method involves oxidizing the gasoline with air oxygen at 110°C for 6 hours under the pressure built up by the saturated test gasoline vapor. Then the total amount of oxidation products is found. Deviations allowable between two parallel determinations must

not exceed 20 percent of the smaller result. Automotive and aviation gasoline stored, in contrast, in large containers were analyzed for chemical stability as well. The gasolines had been kept in 17 above-ground containers with a 5000 m<sup>3</sup> capacity, located in the temperate climatic zone (12 tanks filled with A-72 gasoline, two--with A-76 gasoline and three with B-95.130 gasoline). Storage time was 13-49 months. Gasoline quality at the beginning of the analysis was determined in terms of the following indicators: actual resin content, acidity, induction time, optical density and chemical stability. Tests showed that after 32-49 months' storage virtually no changes were found in actual resin content, acidity and chemical stability. For automotive and aviation gasolines of different group composition the chemical stability was 12-45 mg/100 ml; for gasoline with highest olefin content it was more than 80 mg/100 ml. Tables 1. [96-10123]

USSR

UDC 665.61[471.43]

#### PETROLEUM OF MEDVEDEVSKOYE FIELD IN KUYBYSHEVSKAYA OBLAST

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 7, 1979  
pp 28-29

LAZAREVA, I. S., MATVEYEVA, G. N., and AKSENOVA, L. V.

[Abstract] Two crudes from the Medvedevskoye field in Kuybyshevskaya Oblast were analyzed: from the coal-bearing horizon (stratum B<sub>2</sub>) and from the Bashkirskiy stage (stratum A<sub>4</sub>). Light fraction contents of the two crudes--up to 350°C--were 52.1 and 67 percent, respectively. Even so, the crude from the coal-bearing horizon was heavier, more sulfur-containing and had less gasoline fractions (up to 200°C--21.5 percent as compared with 36.5 percent in the Bashkirskiy stage crude) and was more paraffinic (7.9 percent paraffin). Though not containing any elemental sulfur, the crudes did have high mercaptan sulfur levels. As to gasoline, gas chromatographic analysis of the light gasoline fraction (boiling up to 120°C) showed that 76 percent (of the coal-bearing crude) and 86 percent (of the Bashkirskiy stage crude) are made up of paraffin hydrocarbons. Since more than half the naphthenic hydrocarbons in the fractions from Bashkirskiy stage crude boiling up to 200°C were six-membered dehydrogenatable fractions, they are good feed for catalytic reforming. Yield, specific gravity, sulfur content (total and mercaptan), temperatures (initial, crystallization and pour point), kinematic viscosity and cetane number were determined for different distillates cuts from the two crudes. Tables 3. [96-10123]

## BIOCHEMICAL TREATMENT OF PETROLEUM-CONTAINING WASTEWATER IN AERATION TANKS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 7, 1979 pp 55-58

KARELIN, YA. A., ZHUKOV, D. D., and SAIDAMINOV, I. A., Moscow Construction Engineering Institute imeni V. V. Kuybyshev

[Abstract] A scaled-up model of two-stage aeration tanks was tested at the treatment station of the Novo-Gor'kiy Petroleum Refinery. Oil-containing and household wastewater contain organic contaminants that can be classified as easily oxidized and oxidized with difficulty. During the test the biochemical oxygen demand (BOD) varied from 127.5 to 215 g/m<sup>3</sup>; the chemical oxygen demand--198 to 396 g/m<sup>3</sup>; and the concentration of ether-soluble substances--17.6 to 55.2 g/m<sup>3</sup>. These indicators characterize the ratio of activated-sludge microorganisms to the contaminants in wastewater. It was found that a heavier load on the activated sludge in terms of easily oxidized organic contaminants, to 30 and 15.5 g/(kg·h) of ash-free sludge material when expressed in terms of BOC<sub>5</sub>, meant that wastewater was 1.5-2 times less well treated with respect to ether-soluble substances. This reduction in treatment efficacy can be explained by the suppressed synthesis of adaptive enzymes in the sludge converting ether-soluble contaminants that are oxidized with difficulty into easily-oxidized substances. A formula for the biochemical treatment of wastewater was derived that reflected this loss in treatment efficacy. Variables and constants in the formula include rate of oxidation of substances hard to oxidize, amount of biomass, coefficient of proportionality--the maximum oxidation rate of substances hard to oxidize; S concentration of these substances in the biochemical reactor; S<sub>1</sub> concentration of easily oxidized substances in the biochemical reactor; and two coefficients. Aeration times were calculated for different sludge loads. Also determined were aeration tank size in the first and second stages of the treatment plant for specified wastewater flow rates, biochemical oxidation demand of wastewater entering the aeration tank and concentration of substances that are hard to oxidize. Figures 2; references 9: 4 Russian, 5 Western. [96-10123]

## OPTIMIZATION OF OXIDATION OF PETROLEUM BOTTOMS

Moscow KHIMIYA I TEKHNLOGIYA TOPLIV I MASEL in Russian No 7, 1979 pp 8-10

LYAKHEVICH, G. D., BEL'KEVICH, P. I., and STANISHEVSKIY, V. N., Belorussian Technological Institute imeni S. M. Kirov

[Abstract] Oxidation of high-molecular compounds in Romashkinskaya field crude was analyzed using multifactor experimental design. The goal was the optimal process for making high-melting bitumens. The experiments



were conducted under a type  $N = 2^3$  complete factor experimental design. A study was made of how the following input variable parameters affected the oxidation process:  $X_1$ —temperature, °C;  $X_2$  air flow rate, liters/(min·kg); and  $X_3$ —oxidation time, min. The output parameters in the oxidation process included:  $Y_1$ —softening point, °C;  $Y_2$ —needle penetration depth at 25°C; and  $Y_3$ —extensibility at 25°C, cm. Analysis of the mathematical model of the oxidation of high-molecular compounds in Romashkinskaya field gudron showed that the factors  $X_1$ ,  $X_2$  and  $X_3$  affect the bitumen qualitative indicators  $Y_1$ ,  $Y_2$  and  $Y_3$  more than the interaction of the former factors. Experimental confirmation showed that bitumens with softening point 76°C, needle penetration depth (at 25°C) of 21 and extensibility (at 25°C) of 13 cm are produced given the following oxidation parameters for the above-named feed: temperature 252°C, air flow rate 42 liters/(kg·min) and run time 81 min. Tables 1; references 7: 4 Russian, 3 Western. [96-10123]

USSR

UDC 665.644.2.002.3:661.183.6

#### CATALYTICAL CRACKING OF REFINED SULFUR-CONTAINING GAS OIL IN ZEOLITE-CONTAINING CATALYST

Moscow KHIMIYA I TEKHOLOGIYA TOPLIC I MASEL in Russian No 7, 1979  
pp 6-8

ORLOVSKIY, M., YERKIN, V. N., SMIDOVICH, YE. V., and KARTASHOV, YU. N.,  
Moscow Institute of the Petrochemical and Gas Industry imeni Academician  
I. M. Gubkin, Trade Unions International of Metal and Engineering  
Industries, and All-Union Scientific Research Institute of Petroleum and  
Gas Refining and the Production of Synthetic Liquid Fuel

[Abstract] A variant of refining catalytic-cracking-charge stock is evaluated as to yield and resulting product quality. In this variant polycyclic aromatic hydrocarbons and some of the sulfur-containing and resin compounds are removed by selective solvent (using phenol or furfural) extraction. The catalytic-cracking-charge stock was vacuum-distilled gas oil from Romashkinskaya field crude and the raffinate isolated from this gas oil by furfural extraction. Raffinate yield was 73.2 percent with respect to gas oil. On comparing the physicochemical properties of vacuum gas oil and the raffinate, we see that the raffinate has low coking capacity and reduced content of sulfur and aromatic hydrocarbons. The gas oil and the raffinate were catalytically cracked on a laboratory unit with a fixed bed of ASHTs-3 commercial catalyst. The temperature was approximately 500°C and the volume flow rate was  $1 \text{ h}^{-1}$ . Though differences in equipment layout and conditions caused differences in the material balances of runs on the laboratory and the pilot-pilot installation, still the gasoline yields were roughly the same: in both cases cracking of raffinate yielded about 7 percent more gasoline than in gas oil cracking; coke yield went down by 0.5-0.7 percent. Also approximately the same was



cracking selectivity: it was 49-49.4 percent for the raffinate. So it follows that gasoline from the catalytic cracking of raffinate is somewhat better in composition than gasoline from cracking gas oil. Raffinate-origin gasoline has certain advantages: given an octane number that is practically the same as that for gasoline from the cracking of gas oil feed, raffinate-origin gasoline has a much higher content of isoparaffinic and a somewhat smaller content of aromatic hydrocarbons. This gasoline has a lighter fractional composition--a higher content of  $C_5$  fractions and fractions boiling to 100°C. Tables 3; references 4: 3 Russian, 1 Western. [96-10123]

USSR

UDC 66.092.147.3:665.637-404/-408

#### THERMOLYSIS OF THE MAZUTS OF HIGH-SULFUR PETROLEUMS

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 628-633

KHADZHIYEV, S. N., KOZLOV, V. T., LEONT'YEV, A. S., SVETOTZAROVA, O. I., ZYUBA, B. I., LEVASHOVA, E. P. and ARCHAKOVA, R. D., Groznyy Petroleum Scientific Research Institute

[Abstract] The thermolysis of mazut in a combination with the processes of catalytic cracking and desulfurization can assure a more thorough processing of high-sulfur crudes. Such thermolysis essentially consists in the selective thermal conversion of fractions with boiling points of above 500-520°C, resulting in the formation of chiefly diesel fuel and charge for catalytic cracking. Experiments with the thermolysis of West Siberian and Arlan high-sulfur mazuts in a pilot thermolysis facility at the Groznyy Scientific Research Institute at 390-410°C show that then the yield of diesel fuel fractions is 8.4-10.1 mass% and that of the 350-520°C fraction, which represents charge for catalytic cracking, 4.1-6.4 mass%. Analysis of experimental data on the group composition of the investigated mazuts before and after thermolysis indicates that with increase in the boiling point of the thermolysis products the content of paraffinic-naphthenic hydrocarbons in these products decreases from 69-73% in gas to 3-8 mass% in the residue, while the content of aromatic hydrocarbons increases from 8 to 56-26 mass%, reaching its maximum in the 520-580°C fraction. At thermolysis of mazuts the tars undergo the most extensive transformation, with 60-64 mass% undergoing decomposition and 9-13 mass% condensing to form asphaltenes. About 26 mass% of the tars remains intact, and it is this that accounts for the insignificant (~0.2 mass%) carbide formation and hence also for the absence of any marked deposition of coke, thus assuring prolonged (more than six months) operation of the facility. These findings were used to develop a combined facility for in-depth processing of the mazut of high-sulfur crudes,

including processes of oriented thermolysis of mazut and its subsequent vacuum distillation, hydraulic cleaning, catalytic cracking, rectification, and compression of the reaction products. This the principal feature of the thermolysis, assuring an insignificant formation of coke and tarry substances, is oriented decomposition of 520-580°C fractions. References 3: all Russian. [20-1386]

USSR

UDC 66.092

# HIGH-TEMPERATURE CATALYTIC CRACKING OF PETROLEUM FRACTIONS WITH THE OBJECT OF PRODUCING LOWER OLEFINIC HYDROCARBONS

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 608-613

VALITOV, R. B., PANCHENKOV, G. M. and PRUSENKO, B. YE., Mos. / Institute of Petrochemical and Gas Industry imeni I. M. Gubkin; Ufa Petroleum Institute

[Abstract] Thermal pyrolysis of petroleum fractions in tubular reactors is and will continue in the near future to be the principal source of lower olefinic and aromatic hydrocarbons for petrochemistry. In this connection, the authors have been working to determine the most favorable composition of the catalyst for the high-temperature cracking of petroleum fractions, on the basis of the factorial method of experiment planning. The experiments were conducted at a constant 2:1 mass ratio between steam and the charge, at a charge feed rate of 1.8 g/g hr, and at temperatures of 650 and 750°C. The independent variables of the process were the  $\text{Fe}_2\text{O}_3$  (mass%) content of catalyst  $X_1$  and the mass ratio between the content of  $\text{K}_2\text{CO}_3$  and that of  $\text{Cr}_2\text{O}_3$  in catalyst  $X_2$ . The optimal composition of the catalyst for the high-temperature cracking of paraffinic-naphthenic charge was  $\text{Fe}_2\text{O}_3$  80-88 mass% and  $\text{Cr}_2\text{O}_3$  5-7 mass%. The release of CO and  $\text{CO}_2$  by the catalyst in the course of pyrolysis is not necessarily an adverse effect. In general, in the presence of catalysts based on the oxides of chromium and iron the yield of the lower olefins in the pyrolysis of petroleum fractions is higher than in the case of pure thermal pyrolysis, and then also virtually all the aromatic hydrocarbons present in the charge can be preserved. References 12: 9 Russian, 3 Western. [20-1386]

## CATALYTIC PYROLYSIS OF HYDROCARBONS

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 583-586

VAIL'YEVA, N. A. and BUYANOV, R. A., Institute of Catalysis, Siberian Affiliate of the USSR Academy of Sciences

[Abstract] Catalytic pyrolysis of petroleum fractions (undecane) was performed with the object of clarifying such questions as the mechanism of action of the catalyst, the concepts of activity and selectivity of the catalyst, the role of transport processes, the temperature ranges and limitations of the catalytic process, the effect of the catalyst on secondary processes, and others. Catalysts such as quartz,  $MgO$ ,  $Al_2O_3$ , were used. Analysis of the experimental findings and the fact that the distribution of products is independent of the nature of the surface, demonstrate that the pyrolysis of hydrocarbons in the presence of catalysts is based on the heterogeneous-homogeneous radical-chain mechanism of action, and that the role of the catalysts reduces to increasing the concentration of free radicals. The concept of selectivity cannot be applied to catalysts here, since they do not affect the mechanism of the unfolding of the process of pyrolysis and their role consists solely in initiating the process. In catalytic pyrolysis the concepts of kinetic and diffusive domains of unfolding of the catalytic reaction do not apply, and only the outer surface of the catalyst is engaged, whereas the inner surface merely promotes deleterious secondary processes reducing the selectivity of the process and the activity of the catalyst. Figures 2; references 6: 5 Russian, 1 Western. [20-1386]

## PYROLYSIS OF HEAVY CRUDE FRACTIONS

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 560-567

CHERNYKH, S. P., MUKHINA, T. N., FURER, S. M., LESOKHINA, G. F. and BARABANOV, N. L., All-Union Scientific Research Institute of Organic Synthesis

[Abstract] Given the continuing growth of ethylene production and the shrinking supply of straight-run gasoline fractions for this purpose, it is of interest to consider the utilization for this purpose of the heavier petroleum fractions such as gas condensates and atmospheric gas oil, which

complicates pyrolysis technology. In this connection, research to streamline pyrolysis technology in this direction at the All-Union Scientific Research Institute of Organic Synthesis is described here. Experiments with gasoline fractions of gaseous condensate from the Orenburg Deposit and fractions of atmospheric gas oil from the Romashkino Deposit were conducted in a pilot pyrolysis facility handling up to 300 cc/hr. The resulting yields indicate that specimens subjected to selective hydrodearomatization result in a  $\leq 75\%$  yield of gaseous products compared with 69% for other specimens, as well as in a 10 rel.% higher relative yield of ethylene and an increase from 20-21 to 26-28 mass% in the benzene concentration of the liquid pyrolysis products. These and other findings point to the expediency of using gas-condensate gasoline as a raw material for pyrolysis. Similarly, hydrodearomatization of atmospheric gas oil facilitates its pyrolysis, especially in the presence of ethane, as also confirmed by industrial-scale operating trials. Thus, hydrodearomatization, which includes not only desulfurization but also the conversion of aromatic hydrocarbons to their naphthenic counterparts, is a promising new method of intensifying ethylene production and eliminating the difficulties associated with the use of heavier petroleum fractions. Then also coke-formation is sharply reduced. While for gas-condensate gasolines the attendant cost-effectiveness is yet to be determined, for atmospheric gas oil this method is clearly cost-effective. Figures 1; references 5: 2 Russian, 1 East German, 2 Western. [20-1386]

USSR

UDC 66.092.147.3

# USE OF STATISTICAL METHODS TO DESCRIBE THE PYROLYSIS OF BENZINES AND GASES

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 556-559

KRAMAZ, E., IMIELNJSKA, T. and WOLFF, A., Krakow Polytechnic Institute, Polish People's Republic

[Abstract] A mathematical description of the pyrolysis process, based on the regression analysis method, is proposed. The method is applied to the results obtained for an industrial benzine pyrolysis facility producing 30,000 tons of ethylene annually. Data on a five-month operating period of the facility relating to outlet temperature, steam supply, amount and chemical composition of raw materials used for pyrolysis, and the yield and composition of the 50-200°C fraction, are analyzed. The mathematical relationship between the yield and quality of benzine following pyrolysis, on the one hand, and the process parameters and charge composition, on the other, is derived on the basis of the regression analysis method. Corresponding regression equations are derived. These equations can be utilized to determine the yield and quality of pyrolytic benzine. Figures 3; references 8: 1 Russian, 3 Polish, 1 Czech, 3 Western. [20-1386]



USSR

UDC [547.217.6+547.659.1]542:92

KINETICS OF THE THERMAL DECOMPOSITION OF BINARY n-DODECANE--DECALIN MIXTURES IN THE PRESENCE OF STEAM

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 535-540

POP, G., PETRE, K., IVENUSH, G. and TOMI, P., Ploesti, Research Engineering-Technological and Design Institute of Petroleum Refineries, Socialist Republic of Rumania

[Abstract] The kinetics of the thermal decomposition reactions of binary n-dodecane--decalin mixtures was investigated in a dynamically isothermal reactor at 900-975°K in the presence of an 0.01 atm partial pressure of the hydrocarbons, achieved through dilution with steam, on varying the concentration of the input hydrocarbon mixture from 0 to 100%. To reduce the catalytic effect of the reactor walls, 60 ml<sup>n</sup>-1 CS<sub>2</sub> was added to the reaction mixture. The fractions with C<sub>6</sub> and higher were subjected to chromatographic and spectrometric examination. The kinetic constants in the Arrhenius equation were computed by the regression method with the aid of a MASIO computer. Analysis of the distribution of reaction products and the course of the distribution curves indicate that the decomposition of n-dodecane and decalin occurs through various reaction mechanisms. For n-dodecane in the presence of steam the reaction mechanism involves intramolecular migration of hydrogen atoms. For decalin, at least in the initial stage, there occurs a molecular-mechanism rupture of one of the naphthlene cycles with the formation of the radical R, which culminates in cracking, dehydrogenation, and dealkylation reactions. The thermal decomposition of n-dodecane--decalin mixtures is accompanied by extensive interactions resulting in complexity of the dependence of rate constants, kinetic parameters, and distribution curves of primary reaction products on the original composition of the mixture and on temperature. Figures 3; references 6: 1 Russian, 1 Rumanian, 4 Western. [20-1386]

USSR

UDC 66.092.147.3

PYROLYSIS OF HYDROCARBONS IN THE PRESENCE OF SULFUR

Moscow NEFTEKHIMIYA in Russian No 4, 1979 pp 523-534

BAJUS, M. and VESELY, V., Bratislava Chemico-Technological Institute, Czechoslovak SSR

[Abstract] Elemental sulfur appears to be a suitable additive in the pyrolysis of low-molecular olefins in reactors with a large inside surface area, as established by experiments in a stainless-steel uniflow reactor. n-heptane of 99.69% purity was used, and the formation of coke



deposits in the reactor was investigated during the pyrolysis of raffinate obtained following the extraction of aromatic hydrocarbons. Normally, following the activation of the inside surface of the reactor by oxidizing agents (air, water vapor) metal oxides form which contribute to the course of secondary reactions with the formation of coke, whereas the addition of sulfur inhibits the formation of coke because then the inside surface of the reactor gets passivated. The protective layer then forming consists of metal sulfides which, in all likelihood, form owing to the reaction between 'SH radicals and the reactor wall. The conversion of heptane in the presence of elemental sulfur is a first-order reaction, and the rate of that conversion is not retarded by the reaction products. Pyrolysis in the presence of sulfur in a small equivalent reactor space causes the decomposition rate to increase by 27.6% compared with pyrolysis in the absence of sulfur. Figures 6, references 11: 5 Russian, 3 Czech, 3 Western. [20-1386]

**NORPLASTS - A NEW CLASS OF SYNTHETIC BUILDING MATERIALS TO BE PRODUCED IN ELEVENTH FIVE-YEAR PLAN**

Moscow IZVESTIYA in Russian 25 Aug 79, p 3

[Article by A. Ivakhnov "A Filling for Polymer"]

[Text] As was reported in our newspaper, the USSR Soviet of Ministers endorsed the work on production of new synthetic materials (norplasts) conducted by the USSR Academy of Sciences Institute of Chemical Physics under the direction of Academician N. Yenikolopov. The USSR Academy of Sciences and some ministries set the task of development and realization of a program of scientific research experimental and drawing and design work in this region and for the organization of experimental-industrial production. The scientific production association "Norplast" is being established to ensure fulfillment of these tasks.

The materials about which we are speaking are based on readily available materials, monomers. Under specific conditions, molecules of these substances, interacting, are combined into a very large supermolecule and, as a result, there are produced so-called high-molecular compounds -- polymers.

Polymers are quite different than monomers in their physical and mechanical properties. We know, for example, that ethylene is a very light combustible gas. Polyethylene produced from it has nothing in common with ethylene. We are all familiar with this material -- we make food packaging, toys and many other everyday articles from it. For another example, consider vinylchloride, a heavy toxic gas. Polyvinylchloride produced from it is completely harmless. It is used in production of artificial fur, as a top for footwear, linoleum, etc.

Polymer materials have become an integral part of our life and they surround us both at home and at work and we cannot imagine what life would be without them. However, it is regrettable that these materials frequently do not meet the demands which we place upon them. Some polymer

materials are not sufficiently rigid and loadings produce undesirable deformations in them and others soften at comparatively low temperatures and some methods of their preparation are based, naturally on this, however, we would like the parts made from polymers to be more heat resistant.

In order to improve the properties of polymer materials, we introduce hard mineral substances (fine talc, asbestos, fiber glass and many others) into them. Such additives are called fillers and materials containing them are called filled materials.

Filled polymers have both their advantages and their disadvantages. For example, it is not always possible to achieve good adhesion, that is, bonding between the polymer and the filler. Most fillers are abrasives and the expensive instruments with which the parts and products are formed, wear out quickly and are out of service. In order to alleviate this effect somewhat, fillers are processed by so-called dressing, that is, substance which strengthens the bond of the surface of the filler with the polymer. However, these dressings are, as a rule, complex chemical compounds which are very expensive.

In addition to all of this, the more filler we attempt to introduce into a polymer, the less processable the mixture of them becomes. It is practically impossible to introduce into a polymer more than 30-35 percent by weight of filler.

There is still another important circumstance. When we introduce, into a polymer, a filler which is approximately 50 times as cheap as it is, we would expect to obtain very inexpensive material. Actually, this is not the case because the processing and production of filled polymers require a vast amount of energy.

In order to avoid the disadvantages which were mentioned above, there is a method, developed at the USSR Academy of Sciences Institute of Chemical Physics. It makes possible production of materials which contain practically any quantity of filler and this filler, without any dressings, bonds beautifully with polymer, with absolutely no wear on the tool used for processing and the end material is formed just as easily as the initial filled polymer.

Instead of producing the polymer and then mixing it with the filler in special equipment, scientists of the AS USSR Institute of Chemical Physics proposed and developed a method for producing supermolecules of a polymer directly on the surface of particles of the filler. Since the monomer is a gas, it penetrates into all the defects on this surface (cracks, slots)

and, polymerizing, seals them tightly, that is, it "heals" the material. The particles are covered by a thick polymer "fur coat" and now it is more proper to refer to them as polymer grains with nuclei of the filler. These grains are then bonded firmly among themselves and a new material is made, the properties of which may be "ordered" beforehand, within very wide limits.

Where will norplasts be used?

To begin with, in construction. One of the construction materials is perlite or, as it is still called "vulcanic glass." Upon heating up to 800-900 degrees, it swells, increasing many times in volume. After this, we saturate it with synthetic resins and produce rather good plates for thermal insulation of buildings. However, in order to satisfy the needs of the country for such plates, it is necessary to have much more resin which we do not have. Attempts were made to use the swollen perlite for filling polymers. However, during this, it crumbled and was reduced in volume again and after formation of the plates, could serve as a very active abrasive. The new method can be used to bond 9 parts by weight of swollen perlite with one part of polymer. This produces plates which, in their lightness and capacity to retain heat, exceed all other thermal insulation materials.

Norplasts are used for production of all kinds of parts, tubes, sheets and many other articles and can replace many construction materials. Specialists have calculated that, even if you disregard the improved physico-mechanical characteristics of norplasts, production of one ton of this material is many dozens of times cheaper than production of a ton of the initial polymers.

In order to accelerate the realization of the new method so that the amounts of norplast needed in the country will be available, the USSR Council of Ministers adopted an appropriate decree. According to it, experimental-industrial production of the new materials will be organized by 1984-1985. Everything necessary for this work will be conducted according to a scientific-technical program which will involve a number of very important programs of the 11th Five-Year Plan. In addition to this production of heat -- insulating norplast plates will be organized in the nearest future.

Meanwhile, scientists are continuing their studies aimed at expansion of areas of use of norplasts. If, for example, it is possible to conduct polymerization on the surface of mineral particles, then why not do this on the surface of metal parts? In this case metal structures, reliably protected from corrosion, will be produced.

The new method may be used in agriculture. Agriculturists are aware that the effectiveness of action of fertilizers or toxic chemicals frequently depends on how opportunely they are applied to the soil. Here is a good idea: cover the fertilizer or toxic chemical particles with a layer of soluble polymer with a specific rate of dissolution. At the required time, the particle is "liberated" from the polymer shell. A similar method may be used to create medicine with a "time-release" course of action. Very, very many more such areas of use of the new method may be listed.

It is remarkable that the formulation of the scientific and technical program mentioned above coincided in time with the adoption of a very important document -- the Decree of the CPSU Central Committee and the USSR Council of Ministers "Concerning Improvement of Planning and Enhancement of the Effect of the Economic Mechanism on the Increase of Effectiveness of Production and the Quality of Work" permeated by the concern for acceleration of realization of scientific-technical innovations.

2791

CSO: 1841/15



**TWELVE-METER WIDE POLYETHYLENE SHEET TO BE PRODUCED**

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 30 Oct 79, p 2

[Article by Zh. Tkachenko, Kiev, "The Sheet Will be Wider"]

[Text] An original experimental line is being assembled at the Bol'shevik Plant for the production of wide polyethylene sheets. The rural builders will receive excellent material. Because of its width, they will be able to speed up erection of hothouses, reliably cover temporary livestock barns and line irrigation ditches, protecting them from filtration.

The polyethylene sheeting that will be produced at the new installation will be 12 meters wide, instead of 6.

The unique automated line was developed by scientists and designers at the Kiev Scientific Research Institute, UkrNIIplastmash [Ukrainian Scientific Research Institute of Plastics]. The economic effect from using the new equipment will constitute 2 million rubles per year.

10,657  
CSO: 1841

USSR

UDC 678.664-405:691.17

# PRODUCTION OF STRUCTURAL SANDWICH PANELS BASED ON RIGID FOAM POLYURETHANES

Moscow PLASTICHESKIYE MASSY in Russian No 8, 1979 pp 41-43

YESIPOV, YU. L., SKUL'SKIY, V. M., METLYAKOVA, I. R., GOMMEN, L. M.,  
PETROV, YE. A., MOLOTKI, P. F. and MITTASH, KH.

[Abstract] Rigid foam (RFP or in Russian PPU) panels are being produced in the USSR and GDR on the basis of continuous- and intermittent-action equipment. Two of the RFP production systems built in the GDR, the SH 4050/1 and the SH 4055, are being delivered to the USSR; they are designed to fabricate panels with various types of substrates (steel, aluminum, cardboard, asbestos cement, bituminized paper, other coil or slab materials). However, they, as well as the Soviet-made PPU-316M system, are of insufficient fire retardant quality. The more recently developed Soviet PPU-316M system displays a higher fire retardant quality. Operating trials of this system when used in the fabrication of S-60 type wall panels showed that the resulting panels display an apparent density of  $50.5 \text{ kg/m}^3$  and adequate mechanical properties. On the whole, the Soviet- and GDR-developed RFP systems are up to the modern level of the production of lightweight structural panels in continuous- and intermittent-action facilities. References 4: 2 Russian, 2 East German. [08-1386]

USSR

UDC 678.029.42:629.113

# USE OF VILAD-11k ADHESIVE IN THE AUTOMOTIVE INDUSTRY

Moscow PLASTICHESKIYE MASSY in Russian No 8, 1979 pp 59-60

KRAVCHENKO, V. K., KUZ'MIN, V. N., BROVAK, G. V. and IL'IN, V. M.

[Abstract] The Vilad-11k polyurethane adhesive, developed in the Soviet Union, has passed operating trials at the NAMI [Central Scientific Research Institute of Automobiles and Automobile Engines] and at the VEB Wissenschaftlich-Technisches Zentrum (GDR). This two-component adhesive consists of a polyester part (component A) and an isocyanate part (component B). It contains no solvents and no highly toxic ingredients, and it hardens at both room and high temperatures. Its exposure at  $393^\circ\text{K}$  for 3 hr with subsequent final hardening at  $293^\circ\text{K}$  for 24 hr increases its shear strength to  $44.2\text{--}48.1 \text{ kg/mm}^2$ . Specimens joined with this adhesive withstand without fracturing vibrating loads in the 80Hz range and an acceleration of 6 g after  $<10^{11}$  cycles. The Vilad-11k adhesive is suitable

for virtually any structural material. The new adhesive has proved its worth when experimentally used in the production of Trabant automobiles in the GDR. The possibility of using it to join glass-plastic components of the bodies and cabs of trucks has been verified in tests at the NAMI. Positive results also have been attained in tests to verify the possibility of using this adhesive for the hermetic sealing of spot-welded joints used in the tropics. All this warrants recommending the Vilad-11k adhesive for broad use in the automotive industry. Figures 2; references 4: 3 Russian, 1 East German [08-1386]

USSR

UDC 541.64:547(538.141+315.3+256.2)

ROLE OF ACTIVE CENTERS IN COPOLYMERIZATION OF STYRENE WITH BUTADIENE INITIATED BY THE n-BUTYL LITHIUM -- TETRAMETHYLETHYLENE DIAMINE COMPLEX

Moscow VYSOKOMOLEKULARNYYE SOYEDINENIYA in Russian Vol 21(A), No 9, Sep 79 pp 2008-2016 manuscript received 3 Jul 78

MELENEVSKAYA, YE. YU., ZGONNIK, V. N., DENISOV, V. M., DOLINSKAYA, E. R. and KALNIN'SK, K. K., Institute of High-Molecular Compounds, USSR Academy of Sciences, Leningrad

[Abstract] Copolymerization of monostyrene with butadiene was induced by means of the n-BuLi -- TMED (tetramethylethylene diamine) complex in benzene at 20°C, for the purpose of evaluating the rate constants of cross-linkage buildup and, specifically, the rate constant of styrene polymerization. The latter was found to be lower than in the case of styrene polymerization induced by n-BuLi alone, indicating a lower activity of polystyryl lithium when in a complex with TMED. A comparative analysis of infrared and proton-magnetic-resonance spectra as well as viscosity measurements with and without catalytic additives reveal formation of complex by monomeric polystyryl lithium and one TMED molecule. Figures 8; tables 3; references 23: 11 Russian, 1 Czechoslovak, 4 German, 7 Western. [04-2415]

USSR

UDC 541.64:547.315.2

#### COPOLYMERIZATION OF ALPHA, BETA-UNSATURATED KETONES WITH ISOPRENE

Moscow VYSOKOMOLEKULARNYYE SOYEDINENIYA in Russian Vol 21(A), No 9, Sep 79  
pp 1938-1944 manuscript received 19 Dec 77

MUSABEKOV, YU. YU., YEROFYEV, V. YU., SHAPIRO, YU. YE., MOSKVIN, A. F.,  
MIRONOVA, N. M. and USTAVSHCHIKOV, B. P., Yaroslavl Polytechnic Institute

[Abstract] Polymers containing the carbonyl group have many valuable properties and can be further chemically modified for various practical uses. With regard to possible direct applications, copolymerization of three unsaturated ketones (methyl-vinyl ketone, vinyl isopropyl ketone, vinyl-3-butyl ketone) with isoprene in toluene at 70°C was studied by the method of proton-magnetic-resonance spectroscopy, with the reaction occurring directly in the spectrometer probe so that the copolymerization constants could be determined from the decrease of monomer concentrations. Inasmuch as the largest error occurs in the measurement of signal intensity by way of integration, this error was minimized by weighting the signals without rotating the test tube with a specimen. An evaluation of the results has yielded data on the copolymerization kinetics. Figures 4; tables 4; references 15: 8 Russian, 7 Western. [04-2415]

USSR

UDC 678.742.2-134.442-2-13]02

#### DEVELOPMENT OF THE TECHNOLOGY OF LARGE-SCALE PRODUCTION OF ETHYLENE-VINYL ACETATE COPOLYMERS

Moscow PLASTICHESKIYE MASSY in Russian No 8, 1979 pp 7-9

DUNTOV, F. I. and GEBAUER, M.

[Abstract] Soviet and GDR experts are jointly engaged in developing large-scale production of ethylene-vinyl acetate copolymers. They developed the "Polimir" method of producing these copolymers by radical copolymerization of the monomers under high-pressure in tubular reactors. The products contain from 2-3 to 40-45% vinyl acetate, depending on the proportions in which they are copolymerized. Two types of production facilities and processes have been developed: one for the production of copolymers containing 2-14% vinyl acetate, and the other, for the production of polymers containing 20-45% vinyl acetate. Copolymers of the first type are processed into films with greater transparency, resistance to weathering, and greater adhesiveness than polyethylene films. Such

copolymer films are widely used in agriculture and packaging. Copolymers of the second type, with a higher content of vinyl acetate, will be widely used for processing into liquid adhesives, various compounds with polymeric and low-molecular substances, coatings, and other products. The copolymerization itself requires the introduction of facilities for the storage, preparation, and proportioning of fresh vinyl acetate and the separation of unreacted, reusable vinyl acetate. The ethylene-vinyl acetate mixture at pressures exceeding 105 atm is homogeneous at any temperature. A block diagram of the copolymer production facility is presented. Figure 1; references 2: 1 Russian, 1 Western. [08-1386]

USSR

UDC 678.742:66.095.2.001.2

# EFFECT OF TECHNOLOGICAL PARAMETERS ON THE REACTION RATE OF THE POLYMERIZATION OF ETHYLENE IN DISPLACEMENT REACTORS

Moscow PLASTICHESKIYE MASSY in Russian No 8, 1979 pp 9-10

[Abstract] The industrial production of polyethylene by the free-radical polymerization method under high pressure is based on the use of either mixing reactors or displacement reactors. In mixing reactors the values of the technological parameters remain constant, but in displacement reactors they vary along the length of the reactor with time of the process. Then, moreover, the initiating agent may completely decompose during shorter (or equal, or longer) period than the period of residence of the reaction zone. The decomposition rate of the initiating agent affects the reaction rate of polymerization. In view of all this, formulas for the effect of technological parameters on the reaction rate of the free-radical polymerization of ethylene in displacement reactors are presented. The factors considered include the proportions of the monomer and the initiating agent, pressure, temperature, reaction rate constant, rate constants of the growth of the polymer chain, decomposition of the initiating agent, and rupture of the polymer chain. Formulas for calculating the yield of the polymer in tubular reactors under high pressures as well as for maximizing the yield as a function of temperature and the decomposition kinetics of the initiating agent are derived. [08-1386]



## SILAR - A NEW SOVIET SILOXANE RUBBER

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 18 Sep 79, p 4

[Article by Special Correspondent A. Valentinov "Uses of Silar" Leningrad]

[Text] It seems, when glancing at this exhibit, the author of the aphorism "God, in creating man, forgot about spare parts for him" would exclaim "But man himself corrected this error!" For here on an exhibition stand at the All-Union Scientific Research Institute of Synthetic Rubber imeni Lebedev were exhibited actual "spare parts" of the human organs -- heart valves, vessels, "parts" of the face, finger joints, all of which were made from a special resin. This resin is produced here at the VNIISK [All-Union Scientific-Research Institute of Synthetic Rubber.]

Senior Scientific Associate, Candidate of Technical Sciences V. Davydova, handed me a small cellophane bag obviously filled with something but it was impossible to say exactly what since the bag was completely transparent.

"This is siloxane rubber," V. Davydova said. It is biologically inert and is not harmful to the organism. This is true only on condition that it contains no foreign admixtures. This is the task assigned to us by medicine to produce a rubber of high chemical purity.

Many scientists in our country and abroad encountered an impasse in the attempt to solve this problem, although, at first glance it did not seem to be a complex situation. In the final analysis the problem did not involve production of apparatus made from stainless steel or enameled steel to ensure the chemical purity of the process nor in the synthesis of rubber in hermetic premises where special devices count the number of dust particles in a cubic meter of air. The problem involves what seems, at first glance, an insignificant detail -- the packing gland. In the synthesis process, the rubber is mixed by special devices, mixers. The packing glands which seal the rollers of these mixers let through particles of machine oil and other substances. They showed me the product of the Kazan Synthetic Rubber Plant which had a yellowish tinge.

This was true not only of the Kazan plant -- the packing glands of mixers had constituted a barrier to chemists of the world for a long time.

As you see, it involved a purely engineering problem -- the development of a packing which would not admit even a single particle of foreign substances. The solution of this problem required prolonged scientific research with involvement of the entire arsenal of devices of physics, chemistry and mechanics. The Scientific Research Institute of Chemical Machinery solved it by developing original apparatus for synthesis of pure siloxane rubbers. Now both institutes are putting it into "condition" but the results already are apparent -- the first batches of the new product are being shipped to consumers.

However, the rubber is only half of the matter. It was impossible to fabricate parts from it because it was too soft and did not hold its shape. It must be converted into (vulcanized) rubber and this appeared to be a task of equal difficulty because it required development of a technology of production of high-purity fillers and the solution of complex problems of chemical synthesis. The exhibits on display indicated that this problem was solved. However, separate "parts" of a human being is not enough for modern medicine. It requires apparatus which will assume completely the function of vital organs (the heart, kidneys, lungs) during complex surgery. Much is being done for the development of such apparatus at the VNIISK.

Senior scientist, Candidate of Chemical Sciences S. Dolgoplosk led me to a microscope and placed something on the stage.

Look!

In the field of the microscope was a completely uniform surface. There were neither cracks nor any other kind of defects. Even metals do not have such solid structure.

"Here it is and it is silar" said S. Dolgoplosk.

Here we combined, in one molecule, a flexible, elastic, silicone block and a rigid plastic and we obtained a material as tough as plastic and as flexible as rubber.

Silar or silicone film was first produced by VNIISK in collaboration with the USSR Academy of Sciences of the Institute of Element-organic Compounds. In spite of the complete absence of even microscopic pores, this material possesses a unique capacity; air passes through it as through a sieve. Oxygen passes through it twice as quickly as does nitrogen. This opens truly fantastic horizons. A small example is if you use silar to cover openings, air in a room appears to be oxygen enriched. Such film is truly a find for inhabitants of industrial centers.

We placed a young mouse in a silar package and lowered it into water and the beast breathed. The film splendidly transmitted the water soluble oxygen and expelled the carbon dioxide. In Japan, a man was placed in a similar package and kept for several hours on the bottom of the sea without harm. You can imagine the possibilities of silar in respect to diving operations. However, VNIISK associates have a different problem.

Silar was developed in the first place for apparatus involving artificial blood circulation or as such apparatus is sometimes called "an artificial lung." There are several designs of such devices but they all have one defect; saturation of the blood by oxygen in them occurs "point-blank" and not through a special membrane, as in the organism. Silar and films like it made possible maximum imitation of gas exchange in the lungs. This, in its turn, permitted switching off the lung patient for "repair" for a much longer time.

This year will see serial distribution and testing in clinics of the first batches of Soviet artificial blood circulation apparatus with silar membranes, VNIISK direct or I. Garmonov has reported.

2791

CSO: 1941

## PROTECTIVE ACTION OF ANTIRADS IN SKN-26 BUTADIENE-NITRILE RUBBER UP TO LARGE ABSORPTION DOSES

Moscow VYSOKOMOLEKULARNYYE SOYEDINENIYA in Russian Vol 21(A), No 9,  
Sep 79 pp 2099-2105 manuscript received 8 Aug 79

PAK, N. I., DEGTEVA, T. G. and SEDOV, V. V., Scientific Research Institute  
of the Rubber Industry and its Zagorsk branch

[Abstract] Antirads are additives which protect elastomers against ionizing radiation. A study was made to determine their protective action on SKN-26 butadiene-nitrile rubber exposed to large doses up to 1600 Mrad. Secondary aromatic amines were added (in the order of increasing effectiveness): phenyl- $\beta$ -naphthyl amine, 2-(n-benzosulfonophenyl amino) naphthalene, 2-(n-toluenesulfonyl-phenyl amino) naphthalene, 4-oxyphenyl- $\beta$ -naphthyl amine. Infrared and nuclear-magnetic-resonance spectroscopy revealed a higher threshold radiation dose necessary for cross-linkage and cyclization to begin, with a slower consumption of  $-C\equiv N$  groups as well as of double bonds in  $-R-CH=CH-R-$  and  $-CH=CH_2$  groups. According to colorimetric tests, not all amines are extracted from rubber after irradiation. None remain in unirradiated rubber, according to infrared spectra. Thermal mass-spectrography revealed that, because of the different degrees of volatility depending on the temperature, almost all 4-oxyphenyl- $\beta$ -naphthyl amine but only some phenyl- $\beta$ -naphthyl amine become bonded to rubber. The effectiveness of antirads is highest during the bonding period, when the amine concentration in rubber increases, and becomes lower after bonding has been completed. Figures 5; tables 2; references: 14 Russian. [04-2415]

## DEPENDENCE OF THE PHASE EQUILIBRIUM IN EPOXY -- RUBBER SYSTEMS ON THE CHEMICAL NATURE OF OLIGOMERIC RUBBERS

Moscow VYSOKOMOLEKULARNYYE SOYEDINENIYA in Russian Vol 21(A), No 9,  
Sep 79 pp 2111-2116 manuscript received 14 Jul 78

ROGINSKAYA, G. P., VOLKOV, V. P., CHALYKH, A. YE., AVDEYEV, N. N. and ROZENBERG, B. A., Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] Concerning the modification of epoxy polymers by rubber, a study was made of the phase equilibrium in binary systems consisting of ED-2 diene epoxy resin and oligomeric rubbers. The latter used in this experiment were: polybutadiene, oligobutadiene with hydroxyl or carboxyl

end groups, copolymers of butadiene and acrylonitrile without or with hydroxyl end groups, and block copolymers of butadiene and isoprene (4:1) without or with hydroxyl end groups or with urethane epoxy end groups. Measurements were made by the interference micrometer method, to determine the concentrations of components within the zone of mutual dissolution and the temperature dependence of solubility. The upper critical dissolution temperature could not be reached, because of its being higher than the rubber decomposition temperature. Here it is calculated, instead, along with the thermodynamic parameters characterizing both the enthalpy and the entropy of the dissolution process according to the Flory-Huggins theory. An analysis of the results reveals that the critical range of dissolution temperatures drops with rising concentration of polar groups in oligobutadiene, though at different rates with hydroxyl and carboxyl groups respectively. They also indicate a high degree of initial association of rubber molecules, which impedes dissolution at temperature below 100°C. Figures 4; tables 2; references 7: 6 Russian, 1 Western. [04-2415]

USSR

UDC 678.763.2:678.031

#### A NEW METHOD FOR SEPARATING CHLOROPRENE POLYMER FROM LATEX

Yerevan PROMYSHLENNOST' ARME III in Russian No 6, 1979 signed to press  
1 Jun 79, pp 47-48

MARGARYAN, A. S., Candidate of Technical Sciences, KUKOLEV, V. P., Candidate of Chemical Sciences, MURADYAN, E. KG., Candidate of Technical Sciences and MARGARYAN, L. S., Engineer

[Abstract] A laboratory study of the process of separating chloroprene rubber from latex by use of HCl salts of amines with molecular weights of 100-400 (including aniline, cyclohexamine and dicyclohexylamine) showed a 1.4 to 3 percent increase in yield of the polymer owing to the formation of water-insoluble nitrogen containing compounds which remain in the rubber. A study of the effluent resulting from neoprene production by this method showed a 15-30-fold reduction in the level of organic and mineral salts. [11-2791]

2791

CSO: 1841



## ECONOMIC TRAINING IN THE DNEPROPETROVSK TIRE PLANT

Moscow KAUCHUK I REZINA in Russian No 7, 1979 pp 3-5

KAZAKEVICH, A. V.

[Abstract] Economics courses in the Dnepropetrovsk Tire Plant are scheduled for 975 worker-students and the schools of communist labor--for 582 worker-students. "Fundamentals of Economics," "Socialism and Labor," "Advanced experience" and "Supervisor's Duties" (for engineering technicians and supervisory personnel) were attended already by 3070 worker-students and the schools of communist labor--by 1826, in the three years of the Tenth Five-Year Plan. Under the long-term plan of economic training, the plant management and the plant union committee each year confirm the number of groups, their strength and the makeup of propagandists and school leaders. Before class exercises, the propagandists are given seminars in the fundamentals of pedagogy, psychology and methods of organizing and conducting classroom exercises. In turn, propagandists arrange for and check up on individual and group commitments and their fulfillment at the tire plant. Regular reports on progress in teaching are read at balance-sheet commissions and expanded dispatchers' conferences. Appraisal of performance in socialist competition also involves judgments on how well economic training is organized. As a result, the plant has won 11 prize standings in the All-Union Socialist Competition since the start of the current five-year plan. This record is exemplified by the more than 300 tire worker-students of the schools fulfilling the three-year plan of the five-year plan by the first anniversary of the new USSR Constitution. Heavy-duty tire assembler V. A. Yermolenko completed his personal five-year plan target in 2 years, 4 months and 28 days. [102-10123]

## INVESTIGATIONS ON DEFORMATIONAL PROPERTIES OF RUBBER DIAPHRAGMS USED IN THE PRODUCTION OF RADIAL CARCASSES FOR PNEUMATIC TIRES

Moscow KAUCHUK I REZINA in Russian No 8, 1979 pp 45-47

VESHCHEV, A. A. and TROFIMOV, A. M., Yaroslavl Polytechnical Institute

[Abstract] Mathematical considerations are applied to the analysis of deformation characteristics of rubber diaphragms used in the manufacture of radial carcasses for pneumatic tires. Comparison of theoretical calculations and experimental deformation data led to the identification of a mathematical formula which provides adequate information on the deformation characteristics of such rubber products. Figures 5; references: 4 Russian. [19-12172]

USSR

UDC 678.762.3.4.048.004.4

# STABILITY OF SKI-3 RUBBER DURING PROLONGED STORAGE

Moscow KAUCHUK I REZINA in Russian No 8, 1979 pp 32-33

PANINA, I. S., L'VOV, YU. A., YESHCENKO, T. D. and PIOTROVSKIY, K. B.,  
All-Union Scientific Research Institute of Synthetic Rubber imeni S. V.  
Lebedev

[Abstract] Currently, commercial lots of SKI-3 rubber, stabilized by a mixture of N-phenyl-beta-naphthylamine and N,N'-diphenyl-n-phenylenediamine, are guaranteed for a storage life of one year. Present evaluation of SKI-3 physicommechanical properties have shown that the period of storage can be extended for 24 months. Tables 1; References: 6 Russian. [19-12172]

USSR

UDC 678.742.2-942.3.-63.062.004.12

# EFFECTS OF CERTAIN FORMULATION FACTORS ON CHLOROPOLYETHYLENE ELASTOMER

Moscow KAUCHUK I REZINA in Russian No 8, 1979 pp 17-20

RONKIN, G. M.

[Abstract] Experimental studies have demonstrated that chloropolyethylene elastomer can be formulated with various cross-linking agents. The chloropolyethylene elastomers possess excellent mechanical and elastic properties and exceed all currently available commercial rubbers in resistance to fire. Tables 2; Figures 4; References 6: 2 Western, 4 Russian. [12-12172]

USSR

UDC 678.4:629.11.012.554.002.2

# CURRENT TRENDS IN IMPROVEMENTS IN THE PRODUCTION OF BUTYL RUBBER INNER TUBES

Moscow KAUCHUK I REZINA in Russian No 8, 1979 pp 5-7

CHESNOKOV, V. V. and MIKHAYLOVA, N. P.

[Abstract] An analysis is presented of the latest advances in butyl rubber formulation, technical steps, and equipment employed in the manufacture of inner tubes. The use of butyl rubber for this purpose appears

promising in that thinner walls can be employed, the use of protective agents (anti-aging, anti-fatigue) in the production of such rubber is not required, and the lower cost of butyl rubber should serve to reduce the production costs of inner tubes. Tables 2; references: 3 Russian. [19-12172]

USSR

UDC 678.023.34:678.012.4

STUDIES ON THE DISTRIBUTION OF THE EXTENT OF CHANGES IN THE MOLECULAR STRUCTURE OF CRUSHED CIS-BUTADIENE RUBBER

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY--KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian No 7, 1979 pp 865-867

KHVEDCHENYA, S. A., KOSTRYKINA, G. I., KITAYEV, YU. B. and ZAKHAROV, N. D.,  
Chair of Elastomer Chemistry and Reprocessing Technology, Yaroslavl  
Polytechnical Institute

[Abstract] Investigations were conducted on structural changes in cis-butadiene rubber subjected to destruction in a hammer-action disintegrator resulting in the formation of 0.25-5 mm (average ca. 3.3 mm) particles. Determinations of the molecular mass from viscosity in toluene, branching from the Huggins constant, and of microstructure from IR data showed that there were no meaningful changes in the microstructure. However, destruction was accompanied by increased branching and, based on the assumption of spherical particles, structural changes were most pronounced in the surface layers of the particles. Further studies indicated that changes inside the particles subjected to high speed disintegration were dependent on the molecular structure of the sample. Tables 2; Figures 3; References: 7 Russian. [22-12172]

USSR

UDC 678.01/06:678.7

THE EFFECTS OF ACRYLIC ACID ESTERS OLIGOMERS ON THE PROPERTIES OF RUBBER OBTAINED IN THE PRESENCE OF SULFUR CONTAINING VULCANIZING SYSTEMS

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY--KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian No 7, 1979 pp 869-871

LOTAKOVA, YE. K., BLOKH, G. A., AFANAS'YEV, YE. S. and VASIL'YEV, N. V.,  
Chair of Rubber Technology, Dnepropetrovsk Institute of Chemical Technology

[Abstract] Initiation of polymerization of acrylic acid esters (AAE) oligomers was investigated in several sulfur containing and sulfur free systems using SKN-18, SKN-26, and SKN-40 rubber preparations. The results showed that 55% polymerization was attained with AAE at 150°C in the presence of sulfur, omega-hexachloroparaxylol (I), and di-2-benzthiazolyldisulfide (II). Thermoinitiated polymerization of AAE did not exceed 10%, attained 30% in the presence of sulfur, did not exceed 14% in the sulfur + II combination, or 37.5% in the sulfur + I combination. The results show that AAE can be incorporated into the formulation of butadiene nitrile rubbers. Tables 3; References: 10 Russian.  
[22-12172]

USSR

UDC 541.183.123.2

DECOMPOSITION OF OZONE ON THE HYDRAZINE FORMS OF CATIONITE KU-2

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY--KHIMIYA I KHIMICHESKAYA TEKHNLOGIYA in Russian No 7, 1979 pp 888-889

MYAGKOY, O. N. and SERDYUKOVA, M. I., Chair of Analytical Chemistry,  
Voronezh State University imeni Lenin's Komsomol

[Abstract] Information is presented on a highly effective method for the decomposition of  $O_3$  formed in various technical processes, which relies on a hydrazine form of the sulfocationite KU-2. The basic reaction is as follows:  $R-N_2H_5^+ + 2O_3 = RH + N_2 + 2O_2 + 2H_2O$ . This approach for the elimination of ozone is 4-6 times as effective as the method utilizing the iodide form of anionites, requires less moisture in the system, and offers easy regeneration. Tables 1; References: 2 Russian.  
[22-12172]

USSR

UDC 628.16

## MOBILE UNIT WITH FLOATING FILTER LAYER FOR EXTENSIVE WATER PURIFICATION

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 7, 1979 pp 7-9

ZHURBA, M. G., candidate of technical sciences (All-Union Scientific Research Institute of Irrigation Mechanization and Techniques and PRIKHOD'KO, V. P., and LITVINENKO, L. L., engineer (Ukrainian Institute of Water Management Engineers)

[Abstract] A new process scheme for extensive water purification was developed using a mobile water treatment installation. The work was done by the All-Union Scientific Research Institute of Irrigation Mechanization and Techniques and the Ukrainian Institute of Water Management Engineers. Truck-mounted, the installation includes initial water feed pumps, a combination treatment unit of prefilter-electric coagulator-filter, bactericidal units for disinfecting water, clarified water tank, control panel and electric current rectifier. Under specified filtering conditions and specific content of suspended matter in the initial water (up to 150 mg/liter, 3-5 micrometer particles account for 40-60 percent), treatment with the FPZ-1 prefilter loaded with 0.8-1.5 mm diameter granules in a 500-700 mm thick layer was 97-65 percent. Final filtration takes place with an FPZ-4 filter with floating load of increased sludge capacity. As for washing, the FPZ-1 prefilter is washed with a backflow of partially clarified water stored in the common space above the filter, with the pump switched off. The FPZ-4 filter is similarly washed, but without switching off the pump feeding water for purification. The new mobile unit has been performing well since 1974, at the Pavlopol'skaya Water Treatment Plant, the Uzlovskiy Plastics Plant and in drip irrigation systems of Moldavian gardens and vineyards. Figures 3; tables 2; references: 5 Russian.

[98-10123]

USSR

UDC 628.165.04

## DESALINATING HIGHLY MINERALIZED NATURAL WATER IN INDUSTRIAL AND HEATING BOILER INSTALLATIONS

Moscow VODOSNABZHENIYE I SANITARNAYA TEKHNIKA in Russian No 7, 1979 pp 3-4

KOSHKOSH, V. I., Engineer (Stavropol'teploenergo), and GEYVANDOV, I. A., Candidate of Technical Sciences (Stavropol' Polytechnic Institute)

[Abstract] Potable water can be made from highly mineralized natural water by incorporating a desalting unit into the thermal layout of an industrial or heating boiler installation. Thermal desalination



is achieved by using the steam pressure drop between the steam generators ( $14 \text{ kg/cm}^2$ ) and the network heat exchanger-boilers ( $1.2 \text{ kg/cm}^2$ ). This difference yields a temperature drop of  $90^\circ\text{C}$ : here a multistage thermal desalination unit can be installed. Highly mineralized water fed to the steam generators of the boiler installation and the evaporators of the multistage thermal desalination unit (MTD) is first extensively softened with a two to three-stage sodium cation exchange resin unit. The distillate of the evaporators and the boilers is cooled, by warming up initial and softened water, then it is sent to the station where potable water is prepared, where it is mixed with suitable proportions of the initial highly mineralized water. Figures 2; tables 1; references: 8 Russian.

[98-10123]

USSR

UDC 66.067.38:541.135.6

#### CONCENTRATION POLARIZATION PHENOMENA IN THE SEPARATION OF SALT SOLUTIONS BY REVERSE OSMOSIS

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1979 pp 437-439

DYTNERSKIY, YU. I. and DMITRIYEV, YE. A.

[Abstract] Laser interferometry was used to study concentration polarization at the membrane during reverse osmosis, as indicated by changes in refractive index. Concentration curves were constructed for aqueous KCl on the surface of a MGA-80 membrane at 10, 15, 20 and  $25 \text{ kgs/cm}^2$  and 100 or 300 mg/l. The dependence of the true selectivity on applied pressure was derived from the curves to be  $(1-x_2/x_3) \times 100\%$ , where  $x_2$  is the salt concentration in the filtrate and  $x_3$  is the concentration at the membrane surface. While selectivity did not change appreciably in the experimental range it has a clear tendency to increase with increasing pressure. This is due to increasing convective flow. Figures 3.

# ACTIVITIES OF INSTITUTE OF ELEMENT-ORGANIC COMPOUNDS OUTLINED

Moscow PRAVDA in Russian 9 Sept 79 p 3

[Text] "There were two continents, and it was believed that they had little in common, that they were unique. These were the two "classical" chemistries--organic and inorganic," Aleksandr Nikolayevich Nesmeyanov said unhurriedly, as if giving a lecture.

This habit is no coincidence, by the way. Student, assistant, lecturer, professor, department chairman, dean of the faculty and finally the head of the university--the distinguished chemist has been closely associated with MGU [Moscow State University] for many years.

"Metalloorganics is a bridge thrown between the two continents," the scientist continued. "It was born at the junction of sciences which appeared to be remote from each other, although with similar names. Now they are united, and that means that an enormous number of compounds with the most varied properties are being put at man's disposal. The researcher finds much that is unexpected along the path of research. Something new is being discovered every day in metalloorganics."

It is natural that Aleksandr Nikolayevich is the poet of the branch of science to which he has devoted his life. The world of chemical reactions is as familiar to him as the streets and squares of our home towns are to us. But this is not enough for fundamental scientific achievements; the boldness and perspicacity of an explorer. A sense of the new is characteristic of Nesmeyanov's school, which numbers hundreds of his students and followers. A number of fundamental investigations into the chemistry of organic compounds of many metals--iron, chrome, manganese, gold, silver, copper, mercury and others--belong to this school. Scientists are discovering a world of chemistry hitherto completely unknown--element-organic compounds, and work in this field is developing so rapidly that in a couple of decades perhaps we will come to speak not of a bridge uniting chemical "continents" but about a single mainland merged from the two.

And the role of catalyst (incidentally, this is almost the most popular term among specialists in element-organics) is played here by that very science, which experiences daily the joy of discovery.

It was born in Moscow on Vavilov Street where the Institute of Element-Organic Compounds of the USSR Academy of Sciences--the first in the world--is located. The works of this institute have been awarded the highest decoration of the Motherland, the Order of Lenin.

"Name the most interesting of them, those whose results are now being applied?" Doctor of Chemical Sciences V. A. Sergeyev, the acting director asks again. "You are putting me in a difficult position, because it is not easy or, more precisely, it is impossible to select one or even several. The specialty of the institute is very wide--from chemization of agriculture to obtaining materials for the most modern technology. We have 5 academicians and 58 doctors of science working for us; 260 persons have defended their master's dissertations. And every group--and there are several of them in any laboratory--is developing its own direction."

Help came from the wall newspaper XHIMIK [The Chemist]; about which Vladimir Aleksandrovich wrote, "It is one of our traditions. It lets the administration of the institute have no peace." In an article about the results of new works of the institute applied in production, the newspaper congratulated the collective of the laboratory headed by Associate Member of the AN SSSR [USSR Academy of Sciences] R. Kh. Freydlina. The scientists have created a basis for obtaining new enamels for automobiles. A large shop at one of the plants was beginning to produce them at just that time...

"No, this is not our success alone," Rakhil' Khatskelevna immediately specified. "We should not be credited with the achievements of others."

"Isn't it true that now automobile enamels will be significantly better?" I persisted.

My interlocutrix smiled.

"They will perhaps not be inferior to the most famous foreign brands. And these enamels are obtained by a simple and waste-free method. And the main thing is that they do not require vegetable food oils....But I repeat, many applied science institutes and the chemical industry have taken part in this work."

Doctor of Chemical Sciences Aleksey Borisovich Terent'yev joined the conversation. He handed me two plates. One was covered with ordinary enamel; the other with the new one. The first plate was all cracked. "This is

what happens to the surface of an automobile after several years of use or after an accident," Terent'yev commented. Not one small chip could be seen on the other plate. "It will even withstand blows with sharp objects," the scientist noted.

"We had not set the goal of obtaining exactly this enamel," Freydlina specified. "Sometimes an investigator hits a 'gold mine' and does not understand it. Fortunately we managed to glimpse their applied significance beyond the purely theoretical, fundamental investigations. And as early as the first stage of research we came into contact with people in production.

A most characteristic admission for staff members of the institute. The laboratory is studying the so-called ramified acids. Usually complex molecules cannot be obtained at one stroke: they are created gradually, step by step. In a way the process is reminiscent of assembly on a production line. On A. N. Nesmeyanov's initiative a group of researchers decided to take the direct path: to construct a complex molecule at one stroke, to obtain it in one process from the simplest raw materials. It was difficult to say whether this was possible or not. The chemists were entering a completely unknown field.

Well, when the first successes began to appear the scientists naturally tried to imagine where their achievements could find application.

"Lacquers and enamels are only one field," says A. B. Terent'yev. "Such acids can be used in the extraction of rare and nonferrous metals. Now not only rich stocks of minerals are being used but also poor ones. And our acids are highly effective, particularly in parting metals."

"It is very important not to lose the qualities of synthesized substances in mass production," R. Kh. Freydlina notes. "For example, we obtained several kilograms of these acids for enamels in our laboratory, then tons, this time on the experimental unit of one of the enterprises of the Ministry of the Chemical Industry. In multi-ton production it is not easy to avoid losses of quality. And we try to help our colleagues from the applied science institutes in the plant as well. That is a tradition of our institute: if work promises an outlet in practice, the scientists themselves must accelerate the process of application. A. N. Nesmeyanov has strived for this since the first day of the creation of the institute."

In any laboratory you will often hear references to the director. And here this is not a question of administrative piety. The reason is much more profound: Academician Nesmeyanov, twice a Hero of Socialist Labor, was at the source of numerous trends in element-organic chemistry. His ideas are being developed by his students and followers.

"We must do everything in order to make life easier for man," the director loves to repeat. Of course, the scientist's attention to the problem of artificial food is related to this. And there has not been a session of the scientific council at which he has not asked for information on these subjects.

"Physicists love to joke." It is customary to think that first place among scientists for humor belongs to them. Collections of their aphorisms and all sorts of stories are even published.

"Chemists love to joke" sounds odd. But the institute's wall newspaper shows in each issue that chemists are also in no way inferior to their colleagues in their sense of humor. Among notes, one came to our attention, the author of which claims that the average person (70 kilograms) consists of 23 elements, including 45.5 kilograms of oxygen, 12.6 of carbon, 7.0 kilograms of hydrogen, 2.1 of nitrogen, 0.14 of strontium, 0.02 of manganese and 0.016 grams of barium. The carbon contained in the organism is enough for six shortcakes; the phosphorus, for 2,200 matches. Well, there is only enough iron in us for one nail. But if there is not enough for this "nail", serious, sometimes incurable, diseases arise.

Paradontosis is a disorder of the teeth and jawbone... Ozena is a disorder of the nasolarynx that is unpleasant for the sufferer's associates ... Regretably, anemia, from which several million people suffer, is well known... These are diseases provoked by iron deficiency. But it is extremely difficult to induce it in the organism. Element-organic compounds, which make it possible to pack an iron atom between organic rings as if in a sandwich, make it possible to surmount this barrier. Scientists of the institute N. S. Kochetkova and V. D. Vil'chevskaya, together with physicians from Leningrad and Moscow have created ferrocenone, to which many hundreds of people are already indebted for their recovery. The pharmaceutical industry has already mastered production of this preparation.

A scientist with a wide circle of interests, possessing the gift of seeing the path of development of science as a whole, Aleksandr Nikolayevich came to a very important conclusion many years ago: the basic development of science occurs at the junctions of the sciences which he descriptively calls "growth centers." And, while president of the USSR Academy of Sciences, A. N. Nesmeyanov gave particular attention to new trends in natural science. Element-organics, born between two chemical continents, clearly confirms the correctness of the scientist's conclusion.

At the AN SSSR [Academy of Sciences] Institute of Element-Organic Compounds, paths are often taken which are unknown to nature. For example, the scientists hope to introduce metal atoms to a previously determined



site on a molecule and in this way remodel it, to alter it and to create one such as people need. The scientists are constructing substances which have never existed and in this way are increasing man's power. He is beginning to compete equally with nature without causing damage to it.

"When I was a student working on my graduation thesis I went to my teacher Nikolay Dmitriyevich Zelinskiy and asked him for a topic," A. N. Nesmeyanov recalls. "I did my thesis but this direction did not attract me. It was then that I started to work in the field of element-organic compounds. That was in 1921."

Science values loyalty. It is revealing ever new islands, archipelagos and even continents to the scientist and his students.

9380

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CSO: 1841